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Bird Ingestion Into Large Turbofan Engines

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Final Report

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16. Abstract

This final report contains findings from a study conducted by the Federal Aviation Administration (FAA) of bird ingestion into certain modern large high bypass turbofan engines. These engines were certificated to current FAA standards and are installed in A300, A310, A320, B747, B757, B767, DC10, and MD11 aircraft in commercial service worldwide. Data pertaining to 644 aircraft ingestion events were collected for the FAA during 1989-1991 by the principal engine manufacturers. Topics addressed in the report include characteristics of ingested birds (numbers, species, and weights), ingestion rates, airports, aircraft parameters (flight phase, altitude, speed, engine position), and ingestion events which pose a potential threat to aircraft safety (multiple-engines or birds, transverse fracture of fan blades, power loss). Using statistical methods, the data are analyzed to determine the influence of flight phase (departure or arrival), bird weight, and bird numbers (single or multiple-bird), both separately and in combination, on overall engine damage, fan blade damage, core damage, and other adverse effects on flight. A summary of all pertinent data from each ingestion is included in an appendix.

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EXECUTIVE SUMMARY

During 1981-83, the Federal Aviation Administration (FAA) conducted a study of bird ingestions into large high bypass ratio (HBPR) turbofan engines [1]. The majority of such engines in service at that time were certificated under airworthiness standards for bird ingestion predating Change 1 (October 1974) to Part 33 of the Federal Aviation Regulations. Over the past decade many newer HBPR engines, that were designed and certificated to more stringent standards, have come into wide-spread service. The current study grew out of a need to ascertain any changes that have occurred in the bird threat and to assess the effects of bird ingestions on these newer, second generation, engines.

The data in this report were generated from over 3 million operations flown by a fleet of more than 1500 aircraft during the period January 1989 through August 1991. Aircraft models include the A300, A310, A320, B747, B757, B767, DC10, and MD11.

A total of 644 aircraft ingestion events were reported by the engine manufacturers, yielding a worldwide ingestion rate of 2.04 events per 10,000 aircraft operations. This is approximately 87 percent of the rate in the 1981-83 FAA study. The foreign ingestion rate is three and one-half times the rate in the United States, compared with two and one-half times in the previous study. However, an analysis of engine damage indicates that domestic ingestions were under reported with respect to foreign.

Aircraft ingestion events were reported to have occurred at 162 different airports worldwide. Schipol Airport in Amsterdam had 20 events and Charles de Gaulle Airport in Paris had 15. The greatest number of events reported at any United States airport was 6, at John F. Kennedy in New York.

There were 31 multiple-engine events, yielding a rate of 9.8 per million operations. Three engines of a B747 ingested birds in one event. The other multiple-engine events all involved two engines of the aircraft. Fifty of the 676 engine ingestions were reported to have involved multiple birds.

The Herring Gull, Common Rock Dove, Black-headed Gull, Common Lapwing, Black Kite, and Eurasian Kestrel were the most frequently identified bird species. Of these, all but the Eurasian Kestrel were identified in the 1981-83 study. The first four were also the most frequently encountered birds during multiple-engine or multiple-bird ingestions. Fifty-nine percent of the events in which a species was identified involved a species that was also identified in the previous study.

Ingested bird weights, both United States and foreign, are similar to those in the previous study. This is true not only in terms of summary statistics (median, mode, mean, etc.) but also in terms of the distribution functions for the weights. As before, the domestic weights tend to be heavier than foreign. There were no multiple-bird or multiple-engine ingestions for which a verified species was determined that involved birds in the 1.5-pound weight class. In contrast, multiple-engine or multiple-bird ingestion of birds in the 2.5-pound weight class were reported in 5 aircraft events. (Weight classes are defined in table 4.6.)

Forty-seven percent of engines that ingested birds had some reported damage, compared to 62 percent in the previous study. Fifty-four percent of current damage to engines is classified as "minor," which typically consists of leading edge distortions or at most three bent, dented, or torn fan blades. Engine damage other than minor is called "significant".

The aircraft ingestion events are fairly evenly split between the departure (takeoff or climb) and arrival (descent, approach, or landing) phases of flight. However, engines ingesting birds during departures sustained damage at about twice the rate as during arrivals. It is verified statistically that engine damage and significant engine damage both tend to occur more often during departures than during arrivals. A similar analysis of the effect of bird multiplicity on engine damage indicates that the higher rate of significant damage found for multiple-bird ingestions compared to single-bird ingestions is statistically significant but that the corresponding effect for any engine damage is inconclusive.

Four logistic regression models are fit for the occurrence of (1) any engine damage, (2) significant engine damage, (3) any fan blade damage, and (4) torn, cracked or broken fan blades, as functions of the predictor variables (i) bird weight, (ii) arrival/departure phase of flight, and (iii) single/multiple birds ingested. All three predictors are shown to be statistically significant in both the "significant engine damage" model (2) and the "any fan blade damage" model (3). However, only bird weight and phase of flight were necessary in the the "any engine damage" model (1), and only flight phase in the "broken fan blade" model (4).

Bird matter was found in the main gas path (core) of 183 (27 percent) of engines that ingested birds. Sixty-one of these had some physical core damage, in all cases to compressors. A surge or stall was reported in 31 engine ingestions. Seven were nonrecoverable surges.

An unscheduled crew action (aborted takeoff, air turnback, etc.) was performed in 14 percent of the aircraft events, which is half the rate of the previous study. There were 16 in-flight engine shutdowns (IFSD's), representing less than 3 percent of all engine events. No more than a single engine of any aircraft required in-flight shutdown or experienced engine failure. In the previous study, nearly 13 percent of the engine events resulted in an IFSD. For events in which a species was determined, birds in the 2.5-pound weight class were involved in 5 of 9 IFSD's, 12 of 49 crew actions, 4 of 11 engine failures, and 2 of 5 uncontained events. In contrast, birds of the 1.5-pound class were identified in only 3 crew actions, 1 engine failure, and no IFSD's or uncontained events.

The following summary compares selected data from both FAA studies. Except where noted, all numbers represent worldwide data.

DATA SUMMARY

	Current Study	1981-83 Study
No. of aircraft	1556	1513
No. of operations	3,163,020	2,738,320
No. of aircraft ingestions *	65/561/644	97/484/638
Ingestion rate (x 10^-4) *	0.70/2.52/2.04	0.99/2.80/2.33
No. of multiple-engine events	31	25
Multiple-engine ingestion rate (x 10^-6)	9.80	9.86
No. of engine events	676	666
No. of multiple-bird engine events	50	65
% Multiple-bird events	7.4	9.8
No. of damaging engine events	316	416
% Damaging engine events	47	62
Mean bird weight (oz.) *	24/20/21	30/27/27
Median bird weight (oz.) *	17/14/14	32/18/18.5
Modal bird weight (oz.) *	40/10/40	40/24/40
Modal bird weight class (lb.) *	2.5/0.5/0.5	2.5/0.5/0.5
No. of crew action a/c evts.	89	129
% Crew action events	13.8	28.2
No. of IFSD engine events	16	85
% IFSD's	2.4	12.8

* US/FOREIGN/WORLDWIDE

1. INTRODUCTION.

1.1 BACKGROUND.

The Federal Aviation Administration (FAA) conducted a study during 1981-83 to determine the numbers, weights, and species of birds being ingested into all large high bypass ratio (HBPR) turbofan engines in service worldwide and to document any resultant damage. The purpose of that effort was to provide data in support of possible changes to the airworthiness certification standards for bird ingestion, so they might better reflect actual service experience. The data were collected by the three principal large engine manufacturers, General Electric (GE), Pratt and Whitney (PW), and Rolls Royce (RR), under contract to the FAA. Results from that study were reported in [1].

The majority of large turbofan engines in revenue service at that time were certificated in accordance with bird ingestion standards predating 1974. Over the past decade, many newer engines that were designed and certificated to more stringent standards have come into wide-spread service. The current study grew out of a need to ascertain any changes that may have have occurred in the bird threat and to assess the effects of bird ingestions on these newer engines.

The abovementioned three engine manufacturers were again contracted by the FAA to provide as much pertinent data as possible on all known bird ingestions into large engines that were certificated under standards of 1974 or later. However, because of complexities in contractual startups, it was not possible to synchronize the initiation of data collection between all three manufacturers. RR data reporting started January 1, 1989, PW followed on January 17, 1989, and GE data collection began July 1, 1989. Each data collection period lasted 26 months. International Aero Engine (IAE) and CFM International (CFMI) data were collected by PW and GE, respectively, and correspond to their reporting periods.

The FAA issued an interim report, [6], on an initial portion of data from this study. Two additional FAA bird ingestion studies, for medium and small turbine engines, were also conducted in recent years. (See [2] and [3].)

1.2 OBJECTIVE.

The objective of this study was to determine the numbers, species, and weights of birds being ingested into certain modern large HBPR turbine engines during worldwide service and to assess the impact of these ingestions on engines and aircraft operations.

1.3 ORGANIZATION OF REPORT.

The main body of the report is contained in sections 2 through 7. These sections are ordered so as to deal with relevant topics according to increasing dependency and complexity. The aircraft fleet under study and operations flown by it are discussed in section 2. Section 3 deals with various kinds of ingestion events and their rates of occurrence. Airports are also discussed there. The population of ingested birds is characterized in section 4 and engine damage is analyzed in sections 5 and 6. All kinds of engine damage are considered in section 5 while the following section concentrates specifically on core damage

and fan blade damage. Section 7 examines certain adverse effects of bird ingestions on aircraft flights and engines. Section 8 contains a summary of results and conclusions.

2. ENGINES, AIRCRAFT, AND OPERATIONS.

2.1 ENGINE CERTIFICATION.

The current study involves all commercial aircraft with large high bypass ratio engines that were certificated under the most recent and most stringent airworthiness standards, i.e., those of Change 1 of October 31, 1974, or Change 5 of March 26, 1984, to Part 33 of the Federal Aviation Regulations. Both of these contain the requirement that an engine having inlet area greater than 3900 square inches continue to operate with 75 percent power and under specified conditions of safety upon the ingestion of a flock of eight 1.5-pound birds. Consideration has been given in recent years to include birds heavier than 1.5 pounds in this "medium bird" certification test. All applicable portions of the current (March 1984) standard relating to bird ingestion are summarized in appendix A.

2.2 ENGINE MODELS.

Table 2.1 lists each of the engine models included in this study, along with its manufacturer, takeoff thrust(s), bypass ratio(s), fan tip diameter, inlet throat area, and year(s) in which it was certified. All engines except the V2500 and CFM56 have inlet areas larger than 3900 square inches and, thus, require an eight-bird "medium bird" certification test. The CFM56-5 was certified with seven 1.5-pound birds and the V2500-A1 with six.

2.3 AIRCRAFT TYPES.

The engine models in table 2.1 have been installed in the following types of aircraft: Boeing B747, B757, and B767; McDonell Douglas DC10 and MD11; and Airbus Industrie A300, A310, and A320. The B747 has four engines while the DC10 and MD11 each have three engines. The remainder are all two-engine aircraft. All engines are wing-mounted with the exception of a single tail-mounted engine on the DC10 and MD11. Table 2.2 indicates the approximate number of aircraft in service worldwide for each aircraft type included in this study, broken down according to engine model. The fleet size, initially about 1100 aircraft, grew steadily to 1556 aircraft during the data collection period. This latter figure is nearly identical to the fleet size in the 1981-1983 FAA study, [1]. A relatively small number of DC10's (only those equipped with JT9-59A engines) are represented here. The B747 and A300 also have substantial numbers of aircraft with older engines that were omitted from this study. The remaining aircraft types are equipped exclusively with engines certificated under Change 1 of 1974 or the current standard.

2.4 AIRCRAFT OPERATIONS.

An **aircraft operation** is simply one complete flight cycle of an airplane. (See Glossary for formal definition.) It was not possible to utilize Official Airline Guide computer tapes to derive operational data as in previous studies [1 and 2] because these tapes do not distinguish between B747, A300 and DC10 aircraft having older engines and those with the newer engine models included in this study. All operational data, including estimates of United States (50 states) and foreign (non-United States) operations, were provided by the engine manufacturers.

TABLE 2.1 ENGINE MODELS

ENGINE MODEL	MANUF.	TAKEOFF THRUST (1000 LB)	BYPASS RATIO	FAN DIAM (IN.)	INLET AREA (SQ.IN.)	YEAR(S) CERTIFIED
JT9D-7Q	PW	53	4.9	92.8	5420	1979
JT9D-59A	PW	53	4.9	92.8	5490	1974
JT9D-70A	PW	53	4.9	92.8	5490	1974
JT9D-7R4	PW	48-56	4.8-5	92.8	5420	1980-82
PW2000	PW	38-42	6.0	77.4	4360	1983
PW4000	PW	52-60	4.9	92.8	5540	1986
CF6-80A	GE	48	4.7	86.4	5380	1981
CF6-80C2	GE	52-60	5.1	93.1	5840	1985
RB211-535C	RR	37.4	4.4	73.2	4290	1982
RB211-535E4	RR	40-43	4.1	74.1	4360	1983
RB211-524G	RR	58	4.3	86.3	5850	1988
RB211-524H	RR	60.6	4.1	86.3	5850	1989
V2500-A1	IAE	25	5.4	63.0	2770	1988
CFM56-5	CFMI	25	6.0	68.3	3080	1987

TABLE 2.2 AIRCRAFT FLEET AT END OF DATA COLLECTION

MANUF.	ENG.MODEL	A300	A310	A320	B747	B757	B767	DC10	MD11	TOTALS
PW	JT9D-7Q				82					82
PW	JT9D-59A	24						16		40
PW	JT9D-70A				7					7
PW	JT9D-7R4	14	30		67		92			203
PW	PW2000					163				163
PW	PW4000	30	28		40		43		7	148
GE	CF6-80A		47				117			164
GE	CF6-80C2	56	82		65		104		12	319
RR	RB211-535C					40				40
RR	RB211-535E4					161				161
RR	RB211-524G				36					36
RR	RB211-524H						9			9
IAE	V2500-A1			27						27
CFMI	CFM56-5			157						157
	TOTALS	124	187	184	297	364	365	16	19	1556

Figure 2.1 gives the number of monthly worldwide aircraft operations for the entire fleet of aircraft under consideration. The numbers are broken down according to engine manufacturer and correspond to their respective reporting periods. For example, there are no operational data from GE for the first six months or from PW and RR in the latter months. These facts, along with a steady growth in the aircraft fleet during the 32 calendar months of data collection, account for the large variation in cumulative monthly totals. As noted in the introduction, IAE and CFMI operational data were collected by PW and GE, respectively, and are included in their monthly totals.

Figure 2.2 indicates the total number of domestic and foreign aircraft operations for each aircraft type over the entire study. As in the previous figure, these numbers correspond to the individual reporting periods of each engine manufacturer. The B757 and B767 together accounted for over 80 percent of domestic operations. There were fewer than 5,000 MD11 operations because this aircraft entered commercial service in December, 1990. With the exception of the B757 and MD11, all aircraft types operated in a predominantly foreign environment. Overall, about 70 percent of the total fleet's operations were foreign. The precise numbers used to generate figure 2.2 are included in table 3.1. Although worldwide operational data are believed to be fairly accurate, the breakdowns according to United States and foreign stemmed, in some cases, from educated guesses by the engine manufacturers and should be viewed as approximations.

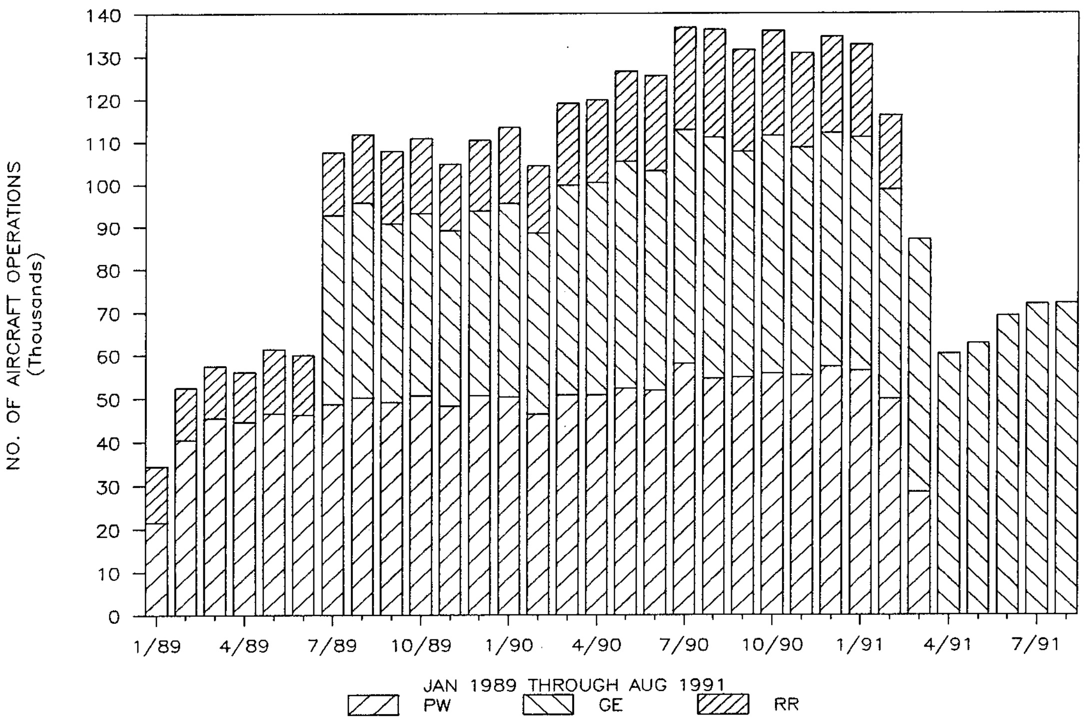


FIGURE 2.1. AIRCRAFT OPERATIONS BY MONTH AND ENGINE MANUFACTURER

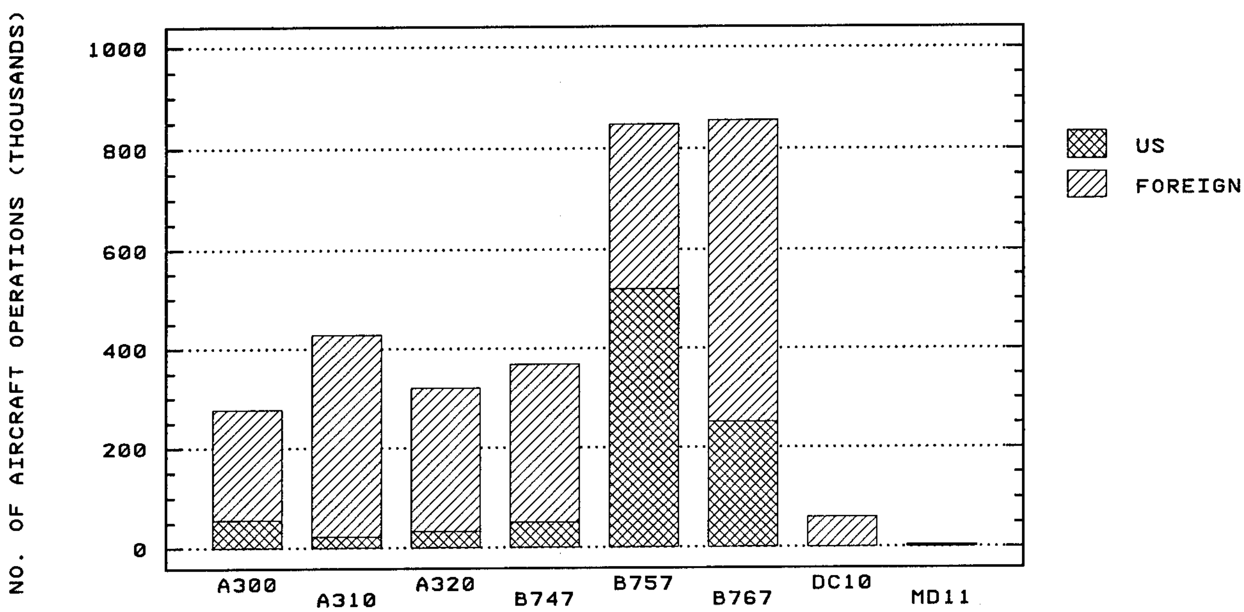


FIGURE 2.2. AIRCRAFT OPERATIONS BY AIRCRAFT TYPE, US/FOREIGN

3. INGESTION EVENTS AND RATES.

In this section various types of bird ingestion events are defined and their frequencies of occurrence are discussed. Although the current study attempts to document all incidents of bird ingestions into the requisite engines, it is likely that many such occurrences remain undiscovered or go unreported. It should be emphasized that only "reported" bird ingestions can be discussed here.

3.1 AIRCRAFT INGESTIONS.

An **aircraft ingestion event** (usually abbreviated as **aircraft ingestion** or **aircraft event**) occurs when one or more birds are simultaneously ingested into one or more engines of an aircraft during an aircraft operation. (See Glossary for formal definition.)

A total of 644 aircraft events were reported by the engine manufacturers. Two of these (events 249 and 636) were foreign "shop findings" in which the aircraft types remain unknown. Figure 3.1 depicts the aircraft type for the remaining 642 events and additionally indicates whether the ingestions took place inside or outside the United States. This latter information is unknown for 18 of the events. Of those remaining, only 65 occurred in the United States. Over 80 percent of the domestic ingestions occurred in Boeing-built aircraft. The foreign events are spread more evenly among the various aircraft types. All DC10 aircraft configured with JT9D-59A engines flew exclusively outside the United States and thus had no domestic ingestions. The B767 experienced 211 events of which 195 were foreign. The A320 and A310 reported 120 and 102 events, respectively, nearly all of which were foreign. Almost half of the domestic events, 30, involved a B757. Overall, there appears to be a relatively small number of reported domestic ingestion events.

3.2 INGESTION RATES.

It is more meaningful, however, to consider the number of ingestions relative to the frequency of exposure. An **ingestion rate** is obtained by dividing a quantity of ingestion events by the corresponding number of operations. Figure 3.2 is a histogram of reported ingestion rates for each aircraft type according to United States, foreign, and worldwide categories. As is customary, these rates are expressed in units of aircraft ingestions per 10,000 aircraft operations. The MD11 and B747 had the highest domestic ingestion rates. The MD11's rate, however, derived from a single aircraft ingestion (event 548) and a small number of operations. The six other aircraft types all had substantially higher foreign reported ingestion rates than domestic. Surprisingly, the only four-engine aircraft (B747) had a smaller worldwide ingestion rate than four other aircraft types.

Table 3.1 summarizes aircraft ingestions, operations, and ingestion rates according to aircraft type and domestic/foreign/worldwide. The numbers therein were used to generate figures 2.2, 3.1, and 3.2. The reported worldwide ingestion rate for the entire fleet was 2.04 (per 10,000 operations), compared to 2.33 in 1981-83 [1]. The foreign rate is 2.52, which is more than 3.5 times the domestic rate of 0.70. In the 1981-83 study [1], the foreign rate was about 2.5 times the domestic rate. This would seem to indicate that bird control measures have been relatively more effective at domestic airports than at airports outside the United States. It is also conceivable that foreign carriers

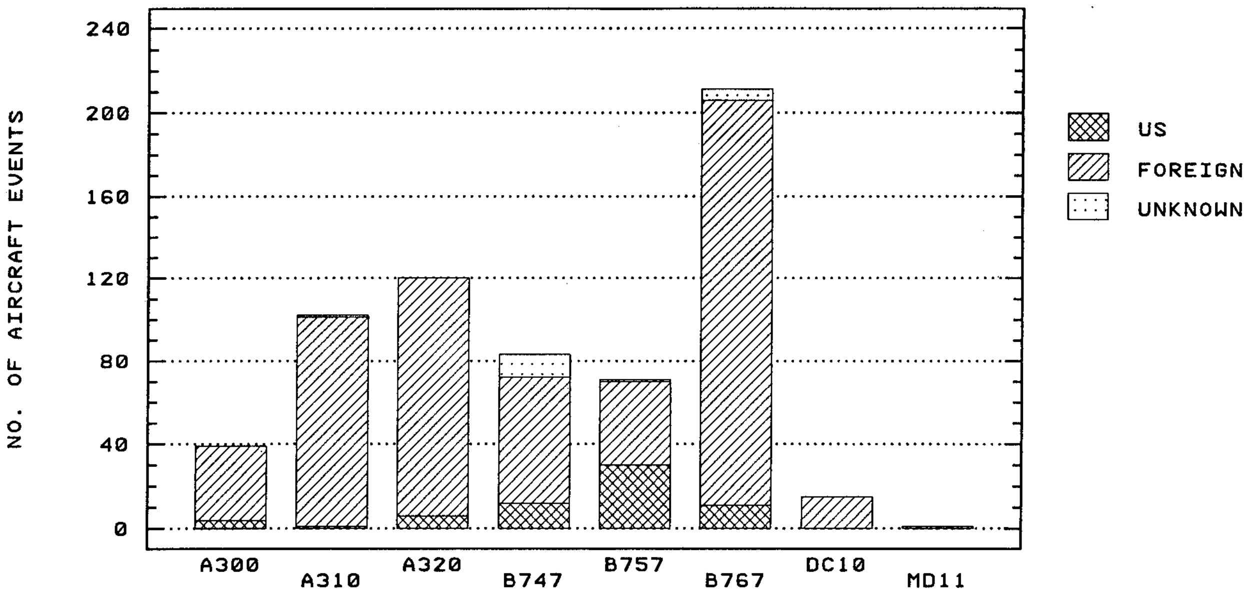


FIGURE 3.1. AIRCRAFT EVENTS BY AIRCRAFT TYPE, US/FOREIGN

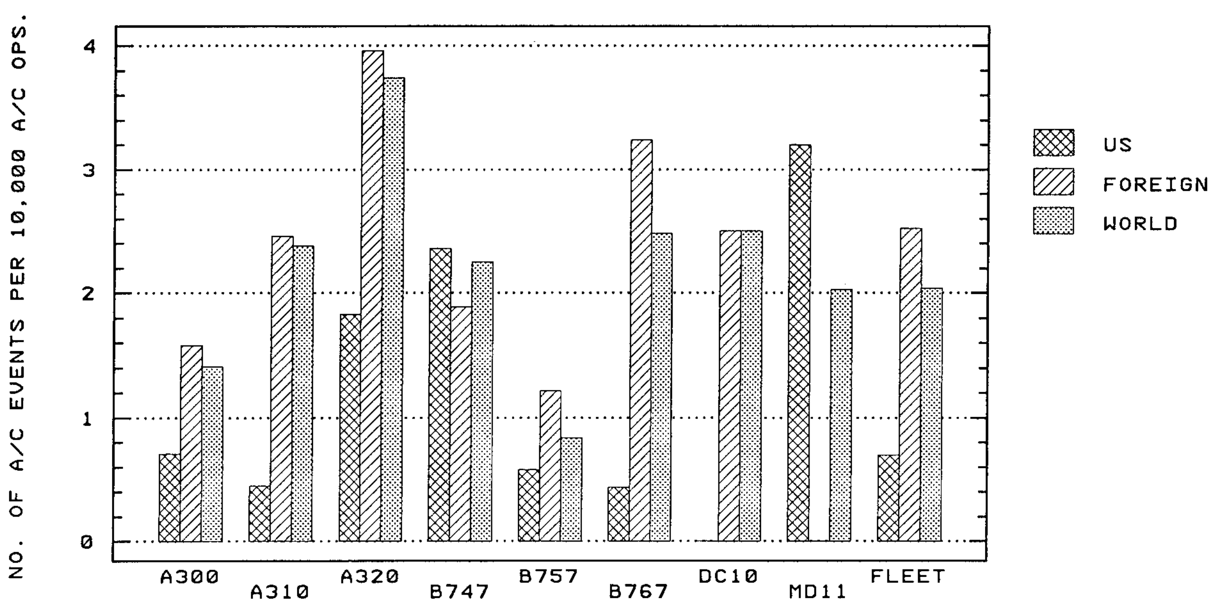


FIGURE 3.2. INGESTION RATES BY AIRCRAFT TYPE, US/FOREIGN/WORLDWIDE

TABLE 3.1 OPERATIONS, INGESTIONS, AND INGESTION RATES BY AIRCRAFT TYPE

	AIRCRAFT EVENTS				AIRCRAFT OPERATIONS			INGESTION RATES (PER 10,000 OPS.)		
	US	FOR	UNK	WW	US	FOR	WW	US	FOR	WW
A300	4	35	0	39	56,453	220,936	277,389	0.71	1.58	1.41
A310	1	100	1	102	22,035	406,313	428,348	0.45	2.46	2.38
A320	6	114	0	120	32,785	287,760	320,545	1.83	3.96	3.74
B747	12	60	11	83	50,759	317,500	368,259	2.36	1.89	2.25
B757	30	40	1	71	519,220	328,564	847,784	0.58	1.22	0.84
B767	11	195	5	211	250,814	604,996	855,810	0.44	3.24	2.48
DC10	0	15	0	15	0	59,964	59,964	-	2.50	2.50
MD11	1	0	0	1	3,125	1,797	4,922	3.20	0.00	2.03
unk a/c	0	2	0	2						
TOTALS	65	561	18	644	935,191	2,227,830	3,163,021	0.70	2.52	2.04

were more diligent than domestic carriers in reporting bird ingestions. The spate of mergers and bankruptcies among domestic carriers may have been a contributing factor to the lower United States ingestion rate. For example, one bankrupt major domestic carrier, which has since ceased flying altogether, reported no bird ingestions although it flew a considerable number of operations during the reporting period with aircraft included in this study. Indeed, an analysis of engine damage in section 5.6 supports the premise of a greater tendency for domestic ingestions to have gone unreported compared to foreign ingestions.

It is likely that route structure and data source each have a profound influence on reported ingestion rates. Worldwide ingestion rates for each of the three engine manufacturers range from a low of 0.96 to a high of 2.84, while domestic rates range from 0.44 to 0.79. Care should also be taken in comparing data from different sources when assessing the influence of engine size on ingestion rates. As tables 2.1 and 2.2 indicate, the A320 engines have the smallest inlet dimensions and the B757 the next to smallest among engines in this study. All the remaining aircraft types are equipped with larger engines of equivalent inlet sizes. However, as table 3.1 shows, the dual engine A320 had the highest worldwide ingestion rate of any aircraft type, while the B747, which carries 4 of the larger engines, ranked fifth. Although the B747 had a somewhat higher domestic ingestion rate than the A320, the latter's domestic rate was significantly higher than those of all other 2-engine aircraft.

Because of the staggered start of data collection, any attempt to derive seasonal effects on the bird ingestion phenomenon by simply counting monthly aircraft ingestions could prove misleading. Again, it makes more sense to look at ingestion rates. Figure 3.3 plots reported worldwide ingestion rates for each of the 32 months of data. Some of the variation can be attributed to the changing data sources over the data collection period. In general, however, the rates are highest from June to September and lowest in December and January. Strictly speaking, this does not show seasonal effects since aircraft operations could not be broken down according to hemisphere. However, only 35 of the 644 aircraft events are known to have occurred in the Southern Hemisphere and the preponderance of aircraft operations were in the Northern Hemisphere.

3.3 PHASE OF FLIGHT.

Some indication of the phase of flight during which an ingestion took place was given for 396 of the 644 aircraft events. Figure 3.4 summarizes these data as reported by the engine manufacturers. All but one event (a cruise) involved a flight phase near an airport. Four events occurred during taxiing and eight during thrust reversal. The remaining 383 are almost equally divided between departure (takeoff or climb) and arrival (descent, approach, or landing) phases. One hundred thirty-one of the departure events and 85 of the arrivals were reported to have taken place on the runway.

3.4 AIRCRAFT ALTITUDE AND SPEED.

Altitudes where ingestions occurred were reported in 297 events, 228 of which took place on the ground. An indication of aircraft speed was given in 189 events. One hundred twenty-six (126) of these were numerical estimates in knots (KIAS) and the rest were reported in terms of V1 (decision speed) or VR (rotation speed). In addition, there were 4 "taxi" events in which no speeds were

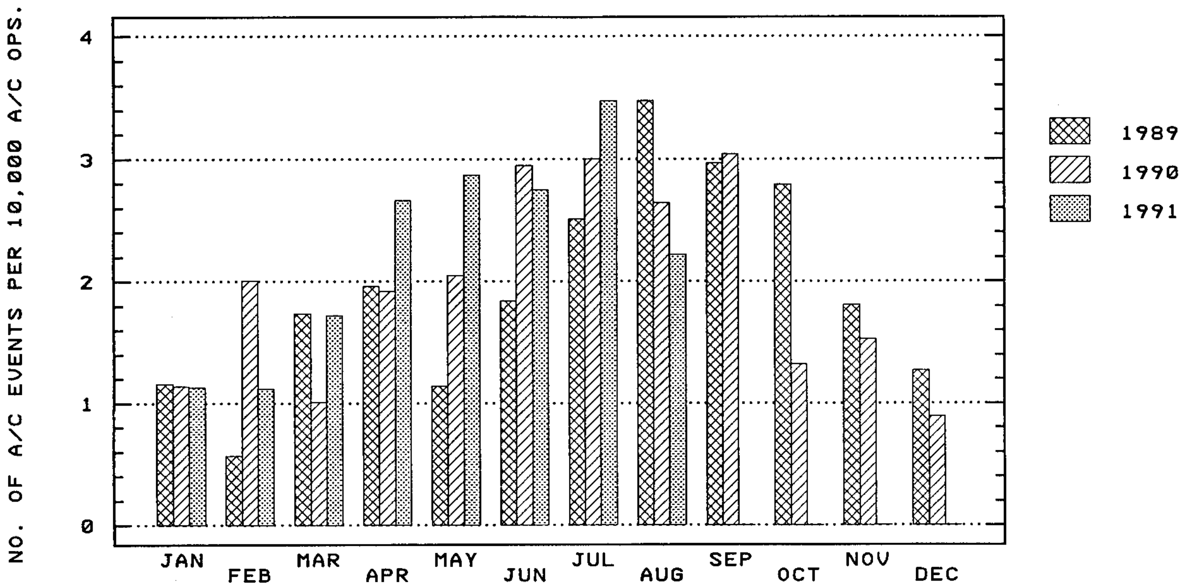


FIGURE 3.3 WORLDWIDE INGESTION RATES BY MONTH AND YEAR

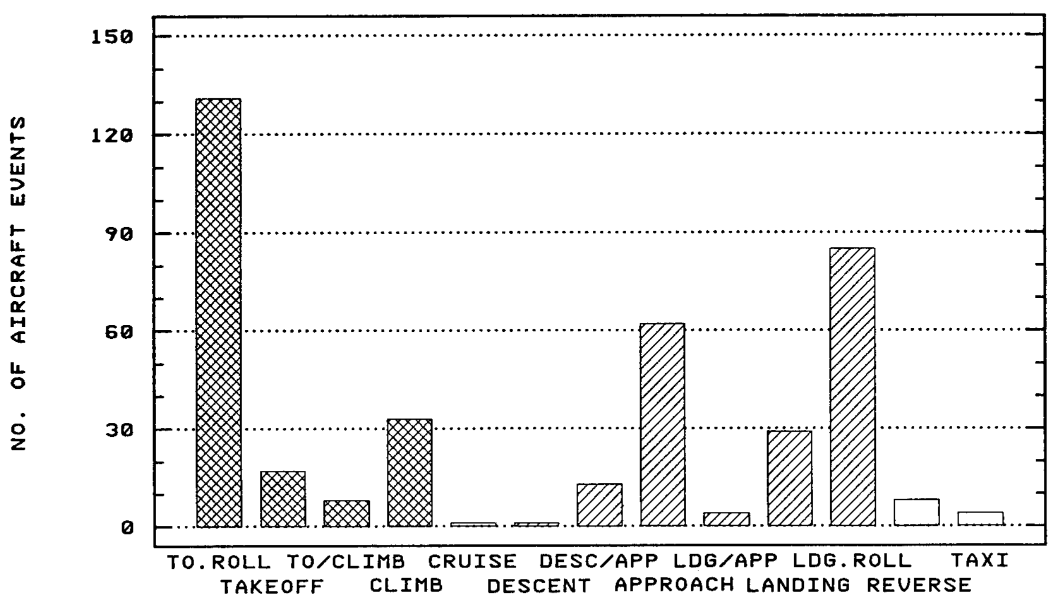


FIGURE 3.4. AIRCRAFT EVENTS BY PHASE OF FLIGHT

reported. Figure 3.5 is a 3-D histogram which tallies aircraft events according to speed and altitude for the 193 events in which altitude was reported and a speed estimate could be made. The altitudes and speeds were grouped into the indicated classes. Speeds given as V1, V1+ or VR were placed in the 145+ to 165 knot class, denoted as (145,165], while speeds reported as VR+ were put into the next higher class. The four taxi events are in the 0 to 60 knot class. An additional 20 "takeoff roll" and 65 "landing roll" events for which speed estimates were not reported are excluded from this figure.

3.5 MULTIPLE-ENGINE EVENTS.

In 31 aircraft events, more than one engine of the aircraft ingested a bird, i.e., there were 31 **multiple-engine events.** Thirty of these involved two engines of the aircraft. In the remaining event (#482) 3 engines of a B747 ingested birds. Figure 3.6 illustrates, according to aircraft type, both the frequencies and rates of multiple-engine ingestion events, worldwide. The rates are given in units of ingestions per million aircraft operations. The aircraft in 6 of the multiple-engine events were B747's, the only 4-engine aircraft included in the study, while the remaining 25 events involved both engines of two-engine aircraft. The B747 multiple-engine ingestion rate is 16.29, about 1.8 times the composite rate for all two-engine aircraft. The overall fleet multiple-engine ingestion rate is 9.80, which is nearly identical to the 9.86 rate of the previous study [1]. Multiple-engine ingestion events are of particular interest because they are a likely prerequisite for the loss of an aircraft due to bird ingestion. They are summarized, along with other types of (significant) events to be discussed later in this section, in table 3.2.

3.6 MULTIPLE-BIRD EVENTS.

All told, 676 different engines ingested one or more birds. Thus a total of 676 **engine ingestion events** (usually abbreviated as **engine events** or **engine ingestions**) occurred during the reporting period. (See Glossary for formal definition.)

When more than one bird is ingested into an engine, the corresponding aircraft and engine ingestion events are called **multiple-bird aircraft events** and **multiple-bird engine events**, respectively. There were 50 multiple-bird engine events. Specific numbers of birds that were ingested in these events are discussed in section 4. In 41 aircraft events, at least one engine of the aircraft ingested more than one bird; i.e., there were 41 multiple-bird aircraft events. Of these, 12 were also multiple-engine events.

3.7 SIGNIFICANT EVENTS.

Each multiple-engine or multiple-bird aircraft event falls into precisely one of the following categories: single-engine multiple-bird (SEMB), multiple-engine multiple-bird (MEMB), and multiple-engine single-bird (MESB). These are all considered to be **significant events.** Other events defined to be "significant" in this study are **involuntary power loss, transverse fracture** of a fan blade, and **airworthiness effects.** The last category encompasses any flight safety-related incident not covered by the previous categories.

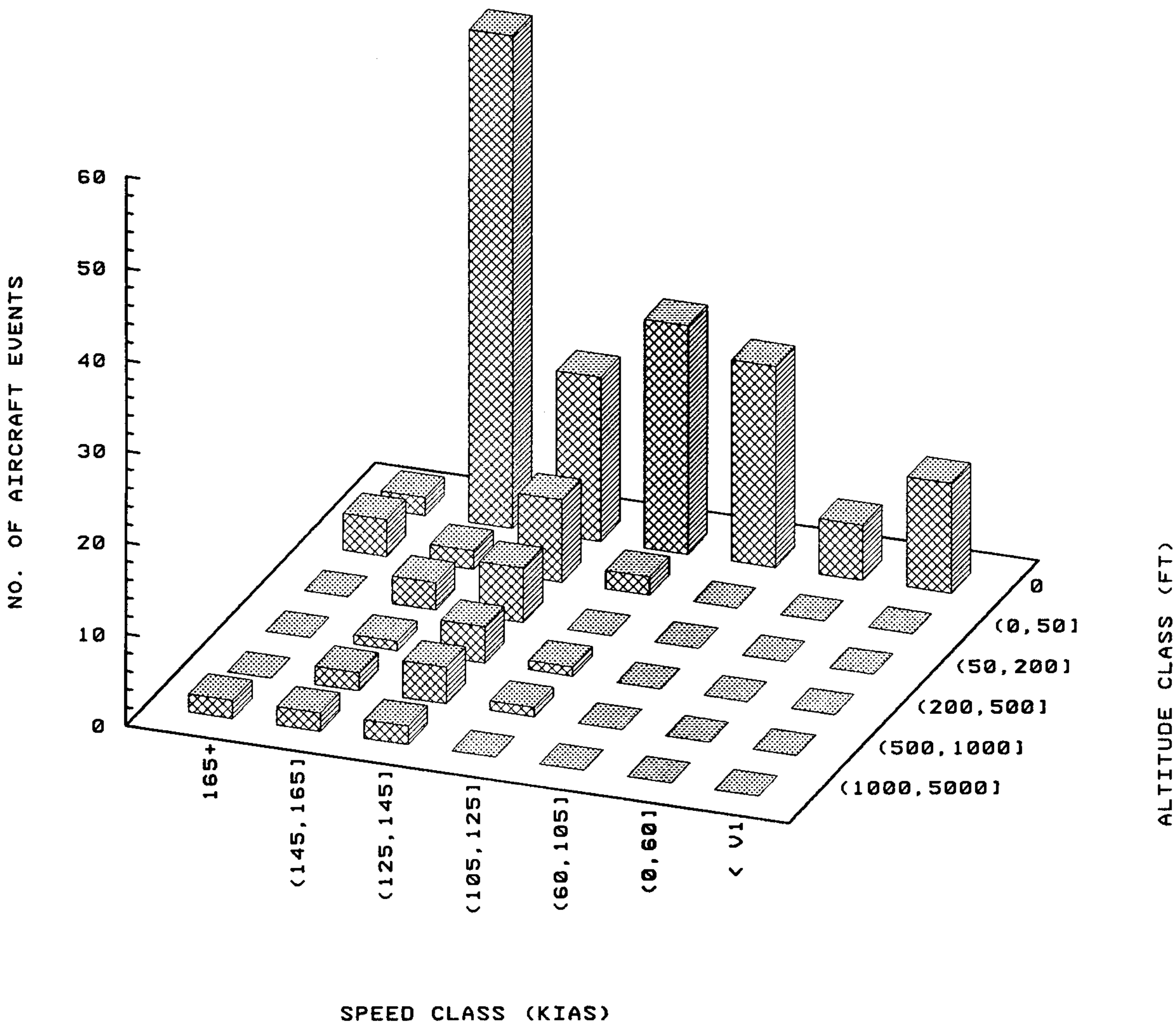


FIGURE 3.5. AIRCRAFT EVENTS BY SPEED AND ALTITUDE

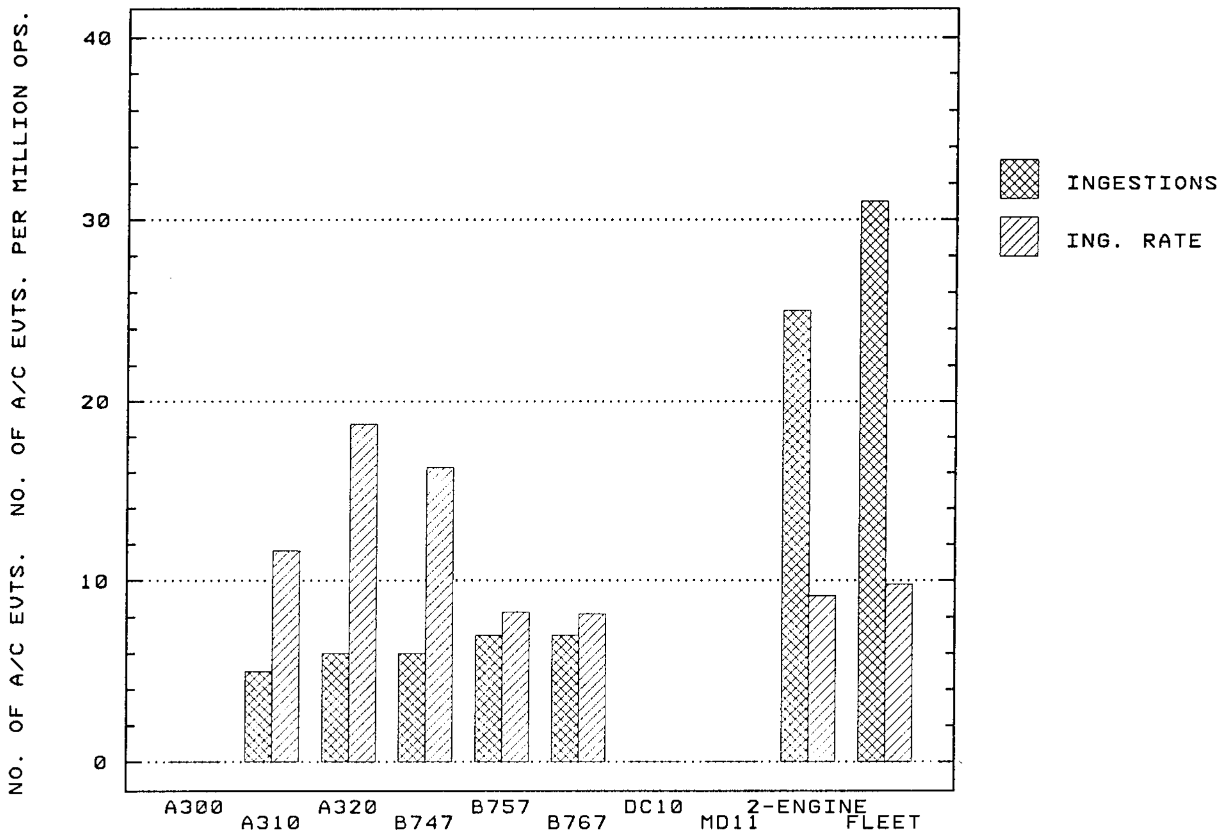


FIGURE 3.6. MULTIPLE-ENGINE EVENTS AND INGESTION RATES BY AIRCRAFT TYPE

Table 3.2 summarizes, in chronological order, the 69 significant events that were reported. Eleven of the 31 multiple-engine events are known to have occurred during departure and 14 during arrival. (The acronyms used for phases of flight are defined in appendix F.) Twelve events resulted in an involuntary power loss, six of which involved the transverse fracture of a fan blade. All twelve occurred during departure. In addition there were two "airworthiness" events--one involving extensive cowl damage (event 16) and the other (event 39) resulting in a reduction from the planned flight altitude. Significant events warrant close scrutiny because of their bearing on flight safety and are discussed in further detail in the ensuing sections.

3.8 ENGINE POSITION.

The aircraft type and engine position were both identified in 670 engine events. Of these, 565 took place in some 2-engine aircraft. Figure 3.7(a) indicates how these were split between the left (#1) and right (#2) engines for each aircraft type. There were a total of 297 left engine ingestions and 268 right engine ingestions in 2-engine aircraft. However, this is not a statistically significant difference. Indeed, if the probability of left and right engine ingestion were the same, then 24 percent of random samples of 565 engine ingestions in 2-engine aircraft would have at least 297 into one of the engines. Since there is no physical reason to expect the split between left and right engine ingestions to be unequal, this analysis illustrates how observed differences can be due to chance error alone.

Figure 3.7(b) plots frequencies of ingestion by engine position for 3-engine aircraft. There was one DC10 event for which the engine position is unknown. The remaining 14 ingestions were evenly split between the left (#1) and right (#3) wing engines. There were no ingestions into the tail (#2) engine. The single MD11 event also involved a wing engine. It is well known from previous studies that wing engines are more prone to ingest birds than tail engines. For example, only 9 of the 180 L1011 and DC10 ingestions in the 1981-83 study [1] were into a tail engine.

The tally according to engine position is shown in figure 3.7(c) for the 90 B747 engine ingestions. The left-most engine (#1) had only 16 events, at least eight less than each of the other three. This is not, however, a statistically significant indication that the engine position ingestion probabilities are unequal. Nearly 27 percent of all samples of 90 engine ingestions into four-engine aircraft would have 16 or less into one of the engines, assuming equal probabilities for each engine. A review of the corresponding data from the 1981-83 study, [1], supports the conclusion that the observed differences are again due to chance error.

3.9 REGIONS.

In addition to the United States/foreign breakdown, ingestion data were classified according to 8 geographical regions. They are: North America, South America, Europe, Africa, Asia, Australia-New Zealand, Pacific, and Middle East. Japan and Thailand are considered to be in the Pacific region, Korea in Asia, and Cyprus in the Middle East. All remaining countries in which ingestions were reported seem to fall naturally into a unique region. Figure 3.8 plots the frequency of aircraft ingestions by geographical region for the 457 events in which the region is known. Europe, Pacific, and North America predominate, in

TABLE 3.2 SIGNIFICANT EVENTS

EVT	DATE	A/C	ENGINE		POF	US/FOR	SIGNIFICANT EVENT
1	01/24/89	B757	RB211	535C	TR	FOR	MESB
16	03/12/89	B747	JT9D	70A	CL	FOR	AIRWORTHY
17	03/13/89	A310	4000	4152	AP	FOR	SEMB
24	04/18/89	B767	JT9D	7R4D		FOR	MESB
168	05/02/89	B747	JT9D	7R4G2			SEMB
31	05/04/89	B767	JT9D	7R4D	TR	FOR	SEMB
32	05/10/89	A300	JT9D	59A	TR	FOR	SEMB,POWER LOSS
39	06/18/89	B747	JT9D	7R4G2	CL	FOR	AIRWORTHY
72	07/19/89	B767	CF6	80C2	TR	FOR	SEMB
140	07/25/89	A320	V2500	A1	TR	FOR	SEMB
74	08/13/89	A310	CF6	80C2	TR	FOR	SEMB
75	08/14/89	B767	CF6	80C2	CL	FOR	TRANSVERSE FRACTURE
171	08/31/89	B747	4000	4056	LR	US	MEMB
138	09/12/89	B747	JT9D	7Q	TR	US	MEMB,TRANSVRS.FRAC.
151	10/04/89	B767	4000	4060			SEMB
112	10/07/89	B757	RB211	535C	LD	FOR	MESB
150	10/07/89	B767	4000	4060		FOR	SEMB
152	10/12/89	B767	JT9D	7R4D	TR	FOR	MEMB,POWER LOSS
155	10/19/89	B767	4000	4060	LR	FOR	SEMB
102	10/21/89	B747	CF6	80C2	CL	FOR	MESB
103	10/23/89	A310	CF6	80C2	TR	FOR	SEMB,TRANSVRS.FRAC.
158	11/02/89	B767	JT9D	7R4D	AP	FOR	SEMB
115	11/18/89	B757	RB211	535C	LR	FOR	SEMB
85	11/21/89	A320	CFM56	5		FOR	MESB
97	12/14/89	A310	CF6	80A	LR	FOR	MEMB
116	12/28/89	B757	RB211	535C	TO	FOR	SEMB
184	01/14/90	B767	CF6	80A	LR	FOR	SEMB
219	01/15/90	B767	JT9D	7R4	AP	FOR	SEMB
193	01/16/90	A310	CF6	80C2		FOR	MESB
244	02/09/90	A310	JT9D	7R4E		FOR	MESB
226	02/11/90	B747	4000	4056			SEMB
201	02/21/90	B767	CF6	80C2	TR	FOR	MESB
225	02/21/90	B767	JT9D	7R4D	AP	FOR	MEMB
292	04/06/90	B767	CF6	80C2	LD	FOR	SEMB
268	05/23/90	A320	CFM56	5	TR	FOR	SEMB
247	05/31/90	A300	JT9D	59A	TR	FOR	POWER LOSS
334	06/02/90	DC10	JT9D	59A		FOR	SEMB
273	06/14/90	A320	CFM56	5		FOR	SEMB
214	06/17/90	B757	RB211	535E4	LD	US	MEMB
257	07/30/90	B757	2000	2037	CL	US	TRANSVERSE FRACTURE

TABLE 3.2 SIGNIFICANT EVENTS (CONTINUED)

EVT	DATE	A/C	ENGINE		POF	US/FOR	SIGNIFICANT EVENT
263	08/05/90	B747	JT9D	7Q	TR	US	POWER LOSS
323	08/14/90	B757	2000	2037	TO	US	MEMB
632	08/17/90	B767	CF6	80A	LR	FOR	MESB
328	09/03/90	B747	JT9D	7Q	TR	FOR	POWER LOSS
382	09/04/90	B747	CF6	80C2	LR	FOR	MEMB
333	09/17/90	B747	JT9D	7R4G2	TX	US	MEMB
437	09/27/90	DC10	JT9D	59A	TR	FOR	SEMB
435	10/14/90	B747	JT9D	7Q	TR	FOR	TRANSVERSE FRACTURE
442	11/14/90	B757	2000	2037	TR	US	MEMB
427	11/24/90	B757	RB211	535C	TR	FOR	MEMB
400	12/03/90	A320	CFM56	5	TR	FOR	MESB
446	12/19/90	B757	2000	2037	RV	US	SEMB
402	12/22/90	A320	CFM56	5	TR	FOR	SEMB
448	12/23/90	B757	2000	2037	CL	US	MEMB
452	01/04/91	B767	4000	4056	LD	FOR	SEMB
463	01/29/91	A310	CF6	80A		FOR	MESB
470	02/04/91	A300	CF6	80C2	TR	FOR	TRANSVERSE FRACTURE
499	02/13/91	B757	2000	2040		US	SEMB
496	03/13/91	B767	JT9D	7R4E	TR	FOR	POWER LOSS
482	03/19/91	B747	CF6	80C2	LR	FOR	MESB
483	03/25/91	B747	CF6	80C2	TR	FOR	SEMB
550	06/03/91	B767	CF6	80C2		FOR	MESB
536	06/23/91	A310	CF6	80A	LR	FOR	MESB
559	07/21/91	A320	CFM56	5	LR	FOR	MESB
563	07/21/91	A320	CFM56	5	LD	FOR	MESB
565	07/29/91	A320	CFM56	5	AP	FOR	MESB
567	08/04/91	A320	CFM56	5	AP	FOR	MESB
590	08/07/91	B767	CF6	80C2	TO	FOR	SESB
573	08/11/91	B767	CF6	80A	TR	FOR	MESB

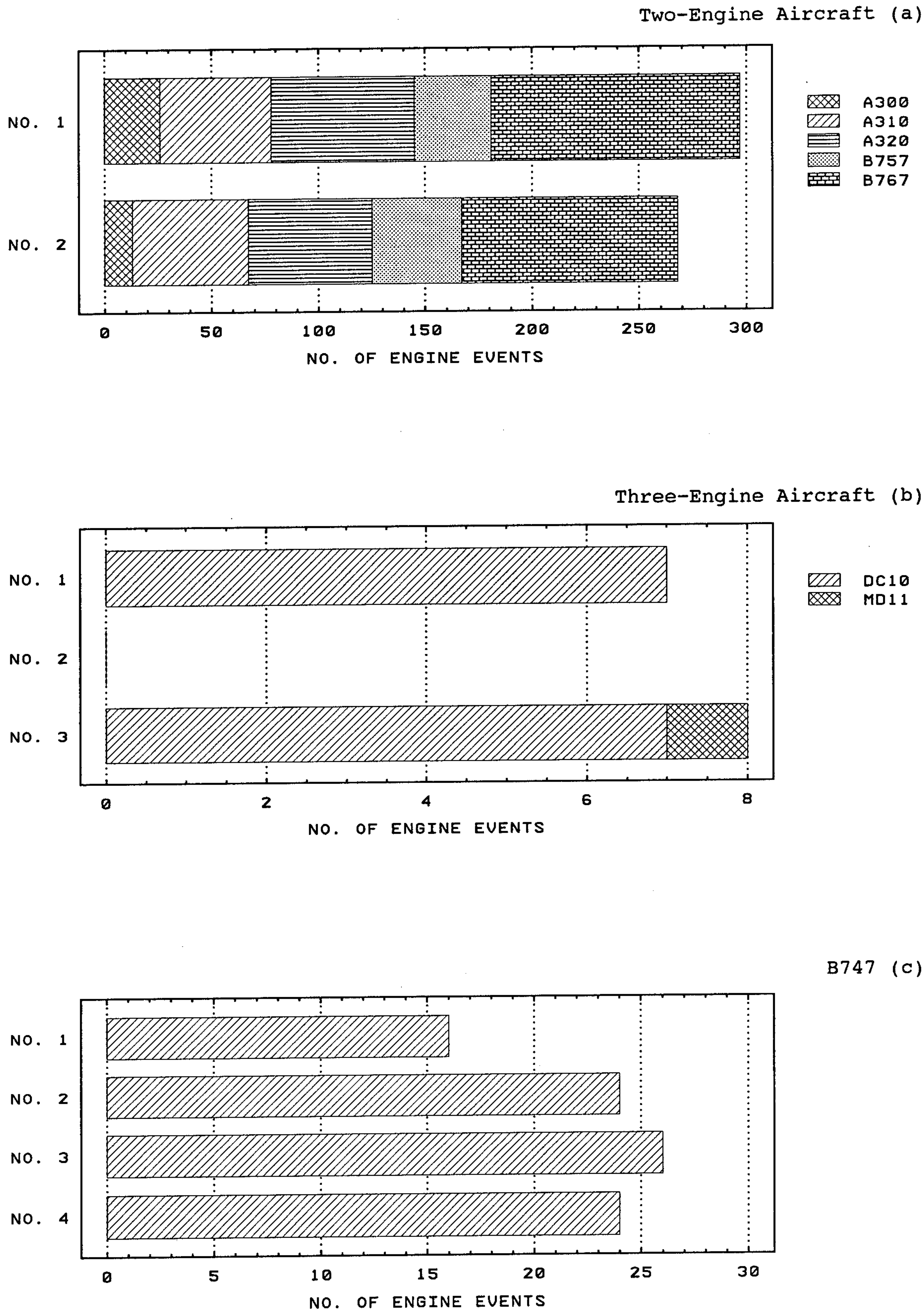


FIGURE 3.7. INGESTIONS BY ENGINE POSITION

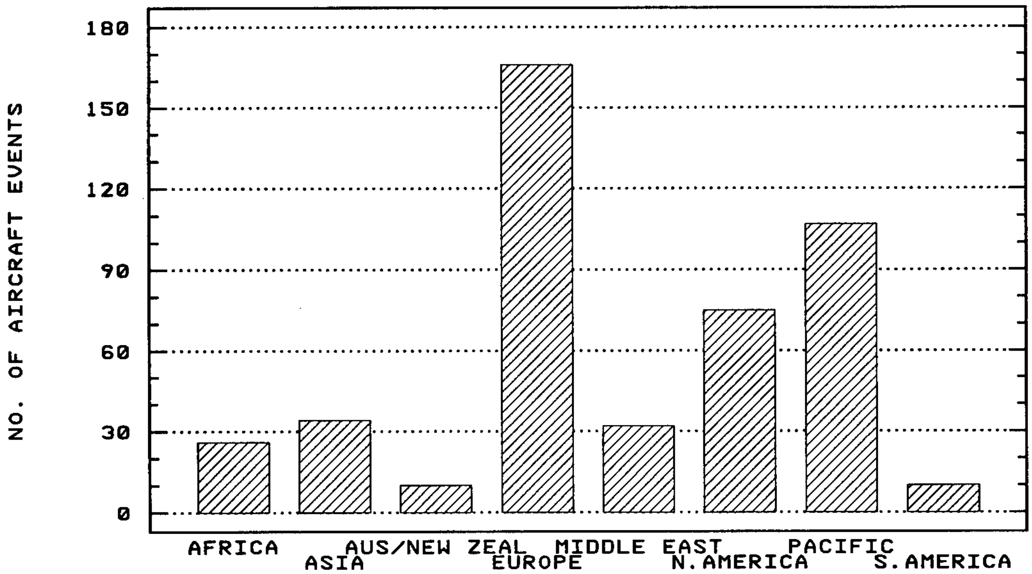


FIGURE 3.8. AIRCRAFT EVENTS BY REGION

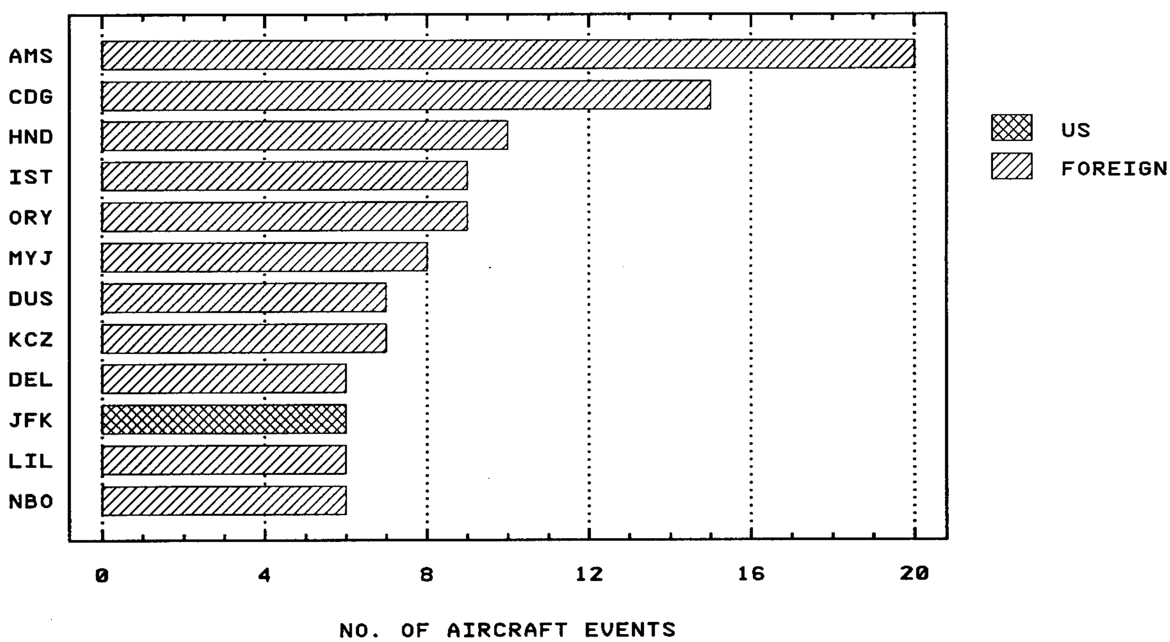


FIGURE 3.9. AIRPORTS WITH SIX OR MORE EVENTS

that order, and together account for over 75 percent of these events. Since operational data could not be broken down by region, computation of regional ingestion rates was not possible.

3.10 AIRPORTS.

The airport near which the ingestion occurred was identified in 393 (61 percent) of the aircraft events. All told, aircraft ingestions are known to have taken place in the vicinity of 17 domestic and 151 foreign airports during the reporting period. For the aircraft events in which the associated airport could not be determined, it was reported that 29 occurred in the United States and 204 were foreign. Figure 3.9 gives the number of aircraft ingestions at each airport reporting 6 or more events. Twenty were reported at Schiphol in Amsterdam and 15 at Charles De Gaulle in Paris. The only domestic airport represented is John F. Kennedy International with 6 events. Airport ingestion rates could not be determined because the requisite operational data were unavailable.

Appendix C lists all airports at which aircraft ingestions are known to have occurred and tallies the aircraft types involved at each airport. The airports are organized into the geographical regions discussed above. Thirty one of the airports, three of which are in the United States, reported four or more events. XUS (respectively XFO) designates an unknown location known to be in (respectively outside) the United States. XXX indicates a location not known specifically to be domestic or foreign. In two cases, events 211 and 293, airports designated XXX are known to be in North America.

3.11 ICAO DATA.

The International Civil Aviation Organization (ICAO) collects data continuously on worldwide bird strikes to aircraft. A search of the ICAO data base yielded 111 "bird strikes" to engines included in this study which occurred during the data collection period but were not reported by the engine manufacturers. Unfortunately, there is no way to tell, in most cases, whether a bird was ingested into the engine or merely struck its case or nacelle. Even when it can be inferred that an ingestion took place, information concerning bird numbers, bird weights and engine damage is extremely limited. Although reference is made to these data from time to time in this report, they have been excluded from any of the analysis. A summary of this "ICAO data" appears in appendix G. Information from the ICAO data base was used, whenever possible, to supplement reports of bird ingestions from the engine manufacturers. This source was particularly valuable in determining time of day, airport, phase of flight, and aircraft speed and altitude for several events.

4. CHARACTERISTICS OF INGESTED BIRDS.

The numbers, species, and weights of birds that were ingested into the engines are discussed in this section. Bird species and weight were determined by licensed ornithologists upon examination of bird remains recovered from the engines. Numbers of birds were estimated by representatives of the engine manufacturers, primarily from the locations and patterns of bird debris in the engines.

4.1 BIRD NUMBERS.

Table 4.1 summarizes the data concerning numbers of birds ingested. Some estimate of the number of birds ingested was obtained in 655 of the 676 engine events. Six hundred and three of the engine ingestions are thought to have involved only a single bird while 50 were determined to be multiple-bird events. In 23 events the exact number could not be determined but rather a minimum and/or maximum number was given. In nine engine events, four or more birds are known to have been ingested. Four of these events were foreign and five were domestic. Two of the latter occurred in a B747 multiple-engine multiple-bird ingestion of 14-ounce Common Rock Doves at Los Angeles (event 138). (See section 5.) For two engine ingestions, estimates of bird numbers were only given as "one or more". It therefore remains undetermined whether these events (154 and 159) were single-bird or multiple-bird ingestions.

4.2 BIRD SPECIES.

The customary difficulty in obtaining comprehensive data on bird types is reflected in the fact that remains were recovered and a species identified in only 198 of the 644 aircraft events. This includes five events in which bats, not birds, were identified. It was discovered that engine #3 of the B747 in event 333 ingested a single 0.5 ounce Yellow-rumped Warbler while engine #4 ingested a pair of 56-ounce Canada Geese. This occurred while the aircraft was taxiing in Anchorage, Alaska. These two species and their corresponding weights are counted separately in this section. In each of the remaining 197 aircraft events the feather identifications yielded a unique species and estimated weight.

Thirty-one of the verified species are domestic and 165 are foreign. It could not be determined whether the ingestion took place inside or outside the United States in three events for which a species identification was made. These are event 137 (a 1.5-ounce Horned Lark), event 130 (a 10-ounce Black-headed Gull), and event 330 (a 0.65-ounce Meadow Pipit).

Figure 4.1 plots the frequency of domestic and foreign aircraft events for the most commonly identified bird species. The species are listed in descending order of worldwide occurrence and include all those involved in four or more events. The Herring Gull was the most frequently identified species (in 17 events), followed by the Black-headed Gull (14 events). The Black Kite and the Common Rock Dove were each identified in 9 events. The 14 species in figure 4.1 together account for 109 (56 percent) of the 194 events for which bird species were determined. Four of these species did not appear in the 1981-83 study; the Eurasian Kestrel, Common Skylark, Black-crowned Night Heron, and Hungarian Partridge.

TABLE 4.1 NUMBER OF BIRDS INGESTED PER ENGINE EVENT

NO. OF BIRDS	*US*	*FOREIGN*	*UNKNOWN*	*WORLDWIDE*
1	*54*	*538*	*12*	*604*
2	*4*	*14*	*0*	*18*
3	*0*	*4*	*0*	*4*
4	*2*	*1*	*0*	*3*
5	*1*	*1*	*0*	*2*
7	*1*	*0*	*0*	*1*
1 OR MORE	*0*	*2*	*0*	*2*
2 OR MORE	*4*	*10*	*3*	*17*
3 TO 4	*0*	*1*	*0*	*1*
4 TO 5	*1*	*0*	*0*	*1*
6 TO 17	*0*	*2*	*0*	*2*
UNKNOWN	*5*	*13*	*3*	*21*
TOTALS	*72*	*586*	*18*	*676*

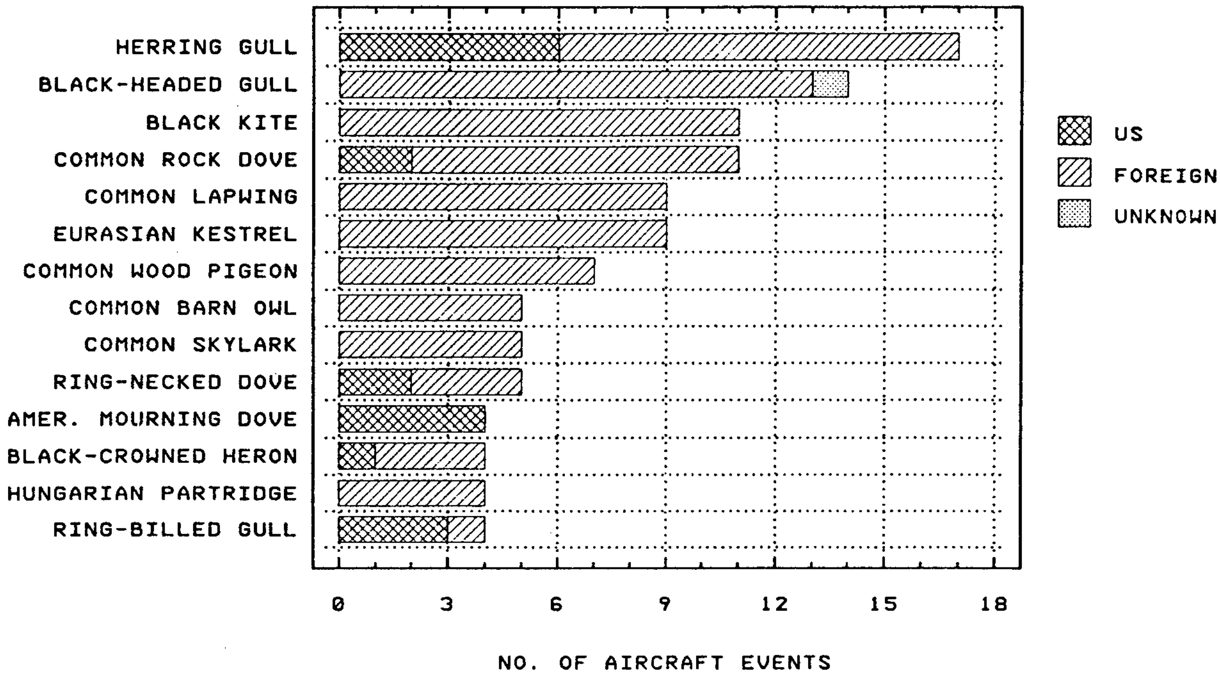


FIGURE 4.1. BIRD SPECIES WITH FOUR OR MORE EVENTS

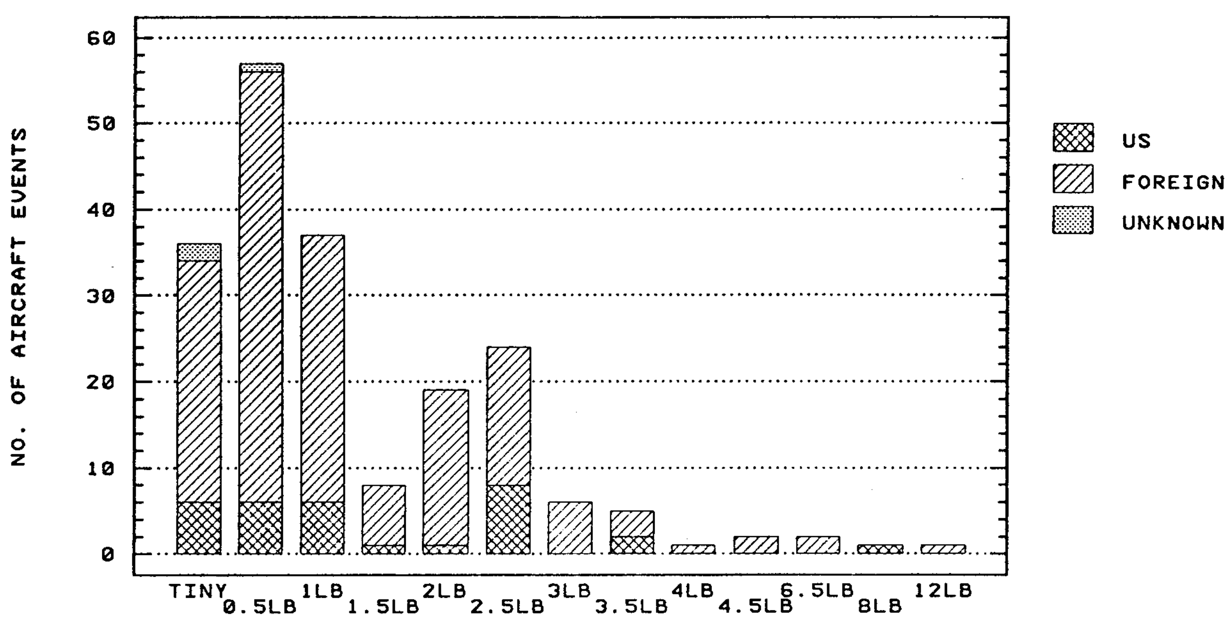


FIGURE 4.2. AIRCRAFT EVENTS BY BIRD WEIGHT CLASS, US/FOREIGN

Table 4.2 summarizes the data regarding all bird species. The number of aircraft ingestions (United States, foreign, and worldwide) are tallied for each species known to have been ingested. Since weight estimates for a given species can vary according to sex, maturity, and geographical location, the modal (most common) estimated weight and the range of estimated weights are also given for each species. The table is ordered by modal weight. Also indicated is the number of single-engine multiple-bird (SEMB), multiple-engine single-bird (MESB) and multiple-engine multiple-bird (MEMB) aircraft events in which each species was involved. The "multiple events" column indicates that the Common Lapwing, Black-Headed Gull, and Herring Gull are also the most pervasive flocking bird species being encountered. The initial two species are "small" birds, having modal weights of 8 and 10 ounces, respectively, while the herring gull modal weight is 40 ounces.

Seventy nine different bird species are represented in table 4.2. Thirty of these can also be found in the 1981-83 data. These 30 species account for 115 (59 percent) of the 194 aircraft events having verified bird species. As mentioned above, four species not identified in the previous study appear in figure 4.1. (four or more events.) Each of the remaining species identified in this study but not the previous one appear in at most two aircraft events.

Bird species codes from [4] are used in table 4.2 and throughout this report. Since different alphanumeric bird species codes from an older publication of E. P. Edwards were used in previous FAA bird ingestion reports, appendix D contains a cross-reference of old and new codes for each species that was identified. The order, family, scientific name and English name of each bird species, along with a tally of aircraft events by month, can also be found there.

As previously mentioned, appendix C lists all airports at which ingestions are known to have occurred and provides the aircraft types involved. It is important, in the interest of bird control, to determine the types of birds that threaten aircraft at any particular airport. Toward this purpose, the last column of appendix C contains a tally of all identified bird species at each airport. The English and scientific name of each species, whose code is given in Appendix C, can be found in appendix D.

4.3 BIRD WEIGHTS.

Whenever possible, bird weights were estimated by the ornithologists from the species, sex, and maturity of the bird and the geographical area and season of the ingestion. When no other information was available, the average weight of a given species was used. All 199 weights for confirmed bird species or bat events are tabulated in table 4.3. The unique weights (in ounces) are listed in ascending order, and the number of United States, foreign, and worldwide aircraft ingestions are tallied for each. Summary statistics (as defined in appendix B) are given in table 4.4 for the same three geographical weight groupings. The mean and median for domestic weights are each a few ounces larger than their foreign counterparts. However, the foreign modal weight is 14 ounces while the United States (and worldwide) modal weight is 40 ounces. These modes distinguish among individual weight estimates that are, for all practical purposes, the same (e.g., 40 ounces and 40.4 ounces.) It is more meaningful to first group the weights into "weight classes". Weight classes as defined in Table 4.6 below are used throughout this report.

TABLE 4.2 BIRD SPECIES

BIRDNAME	SPECIES CODE	MODAL WT.(OZ)	WT RANGE (OZ)	US/FOR/WW	MULTIPLE EVENTS
COMMON SAND MARTIN	Z15b31	0.5		0 1 1	
YELLOW-RUMPED WARBLER	Z57a38	0.5		1 0 1	
MEADOW PIPIT	Z17a41	0.65		0 0 1	
BARN SWALLOW	Z15b39	0.75		0 2 2	
BAT	BAT	1	0.3-1	0 5 5	2MESB
RUFOUS-BREASTED SWALLOW	Z15b55	1		0 1 1	1SEMB
CHIMNEY SWIFT	U3b43	1		0 2 2	
SWAINSON'S THRUSH	Z21a253	1		1 0 1	
COMMON SWIFT	U3b68	1,1.5	1-1.5	0 2 2	
DON-SMITH'S NIGHTJAR	T4b49	1.25		0 1 1	
HORNED LARK	Z14a83	1.5	1.5-2	1 1 3	1SEMB
FORK-TAILED SWIFT	U3b70	1.5		0 2 2	
LEAST TERN	P5b33	1.6		0 1 1	
CORN BUNTING	Z65c3	1.7		0 1 1	
COMMON SKYLARK	Z14a81	2	1.3-2	0 5 5	
AMERICAN ROBIN	Z21a325	2.5		2 0 2	
COMMON NIGHTHAWK	T4a5	2.5		1 0 1	
SCHRENDK'S BITTERN	I1d6	3		0 1 1	
COMMON STARLING	Z53a82	3		0 2 2	
KILLDEER	P14b6	3		0 1 1	
ROSEATE TERN	P5b15	4		0 1 1	
AMERICAN MOURNING DOVE	Q3a108	4		4 0 4	
AMERICAN KESTREL	J5b11	4		1 0 1	
RUDDY TURNSTONE	P17b1	4		0 1 1	1SEMB
COMMON SNIPE	P17d9	4,5	4-5	0 2 2	
RING-NECKED DOVE	Q3a62	5		0 1 1	
LESSER GOLDEN PLOVER	P14b37	5		0 1 1	
SENEGAL COUCAL	S2f24	7		0 1 1	1SEMB
BANDED PLOVER	P14a5	7		0 1 1	
EURASIAN KESTREL	J5b12	7	7-8	0 9 9	
COMMON LAPWING	P14a1	8	7.7-8	0 9 9	2MESB 2SEMB
FRANKLIN'S GULL	P5a40	9		1 0 1	
GREATER KESTREL	J5b18	9.6		0 1 1	
BLACK-HEADED GULL	P5a35	10		0 13 14	1MESB 2MEMB 2SEMB
GRAY-HEADED LAPWING	P14a12	10		0 2 2	1SEMB
MASKED PLOVER	P14a6	11		0 1 1	
SILVER (RED-BILLED) GULL	P5a32	11		0 3 3	
COMMON BARN OWL	K1a2	11	11-12	0 5 5	
CHIMANGO FALCON	J5a10	12		0 1 1	
SHORT-EARED OWL	K2c7	13		1 1 2	

TABLE 4.2 BIRD SPECIES (CONTINUED)

BIRDNAME	SPECIES CODE	MODAL WT.(OZ)	WT RANGE (OZ)	US/FOR/WW	MULTIPLE EVENTS
COMMON ROCK DOVE	Q3a1	14		2 9 11	2MEMB 1SEMB
HUNGARIAN PARTRIDGE	M5b59	14		0 4 4	1MESB 1SEMB
COMMON GULL	P5a12	16		0 1 1	1MEMB
RED-LEGGED PARTRIDGE	M5b16	16		0 1 1	
EURASIAN STONE-CURLEW	P9a1	16		0 1 1	1SEMB
RING-BILLED GULL	P5a14	17		3 1 4	1MEMB 1SEMB
LITTLE EGRET	I1a23	17		0 1 1	
COMMON WOOD PIGEON	Q3a9	18		0 7 7	
CHUKAR	M5b12	18		0 2 2	1MEMB
CARRION CROW	Z51a31	19		0 1 1	
BLACK-TAILED GULL	P5a11	21		0 1 1	
PEREGRINE FALCON	J5b44	22		0 1 1	
EURASIAN MARSH HARRIER	J4a82	23		0 1 1	
BLACK-CROWNED NIGHT-HERON	I1b2	24		1 3 4	
AFRICAN EAGLE OWL	K2a57	26		0 1 1	
BLACK KITE	J4a31	28	28-32	0 11 11	
COMMON PINTAIL DUCK	L2e40	30		0 1 1	
COMMON BUZZARD	J4a180	32		0 2 2	
COMMON POCHARD	L2e60	35		0 1 1	1SEMB
GREAT EGRET	I1a13	38		0 1 1	
BLACK-HEADED HERON	I1a7	38		0 2 2	
GREATER SCAUP	L2e69	40		0 1 1	1MEMB
HERRING GULL	P5a24	40	32-40	6 11 17	1MESB 1MEMB 2SEMB
RING-NECKED PHEASANT	M5b141	40	32-48	2 3 5	1MEMB
MALLARD DUCK	L2e30	40		0 1 1	
SPOT-BILLED DUCK	L2e34	40		0 2 2	
WESTERN GULL	P5a19	40.4		1 0 1	
GYRFALCON	J5b43	46.4		0 1 1	
GLAUCOUS-WINGED GULL	P5a20	48		0 1 1	
BLACK VULTURE	J1a1	48		0 2 2	
TURKEY VULTURE	J1a2	52		0 1 1	
HELMETED GUINEA FOWL	M3a3	52		0 2 2	
OSPREY	J3a1	55		1 0 1	
GREAT BLACK-BACKED GULL	P5a16	60		0 1 1	1MESB
CANADA GOOSE	L2c19	56,128	56-128	2 0 2	1SEMB
EGYPTIAN VULTURE	J4a46	75		0 2 2	
AFRICAN FISH EAGLE	J4a36	100		0 2 2	
INDIAN WHT-BCKD VULTURE	J4a48	192		0 1 1	
			TOTALS	31 165 199	

TABLE 4.3 BIRD WEIGHTS BY US/FOREIGN/WORLDWIDE

BIRD WEIGHT	US	FOR	UNK	WW
0.3		1		1
0.5	1	2		3
0.65			1	1
0.75		2		2
1	1	7		8
1.25		1		1
1.3		1		1
1.5	1	4	1	6
1.6		1		1
1.7		1		1
2		4		4
2.5	3			3
3		4		4
4	5	3		8
5		3		3
7		8		8
7.2		1		1
7.7		4		4
8		7		7
9	1			1
9.6		1		1
10		15	1	16
11		8		8
12		2		2
12.7	1			1
13		1		1
14	2	13		15
16		3		3
17	3	2		5
18		9		9
19		1		1
21		1		1
22		1		1
23		1		1
24	1	3		4
26		1		1
28		9		9
30		1		1
32	1	6		7
34		1		1
35		1		1
36		1		1
38		3		3
40	7	12		19
40.4	1			1
44		1		1
46.4		1		1
48		4		4
52		3		3
55	1			1
56	1			1
60		1		1
75		2		2
100		2		2
128	1			1
192		1		1

TOTALS	US	FOR	UNK	WW
	31	165	3	199

ALL WEIGHTS ARE IN OUNCES

TABLE 4.4 BIRD WEIGHT SUMMARY STATISTICS
CURRENT STUDY

STATISTIC	US	FOREIGN	WORLDWIDE
SAMPLE SIZE	31	165	199
MEAN	24.1	20.2	20.5
MEDIAN	17	14	14
MODE	40	10	40
STD. DEVIATION	26.2	22.5	23
MINIMUM	0.5	0.3	0.3
MAXIMUM	128	192	192
LOWER QUARTILE	4	7	7
UPPER QUARTILE	40	28	32

TABLE 4.5 BIRD WEIGHT SUMMARY STATISTICS
1981-83 STUDY

STATISTIC	US	FOREIGN	WORLDWIDE
SAMPLE SIZE	55	180	250
MEAN	30.4	26.8	27.1
MEDIAN	32	18	18.5
MODE	40	24	40
STD. DEVIATION	21.5	35.9	32.3
MINIMUM	1	1	1
MAXIMUM	112	240	240
LOWER QUARTILE	14	11	11
UPPER QUARTILE	40	28.5	32

ALL WEIGHTS ARE IN OUNCES

Summary statistics from the 1981-83 study corresponding to those in table 4.4 are given in table 4.5. (Since only verified weights are considered in this report, the numbers in table 4.5 vary somewhat from those in [1].) The mean, median, and modal weights for all three geographic categories are, in general, somewhat larger than in the current study. However, domestic and worldwide modal weights are again 40 ounces. As in the current study, United States bird weights are, in terms of these summary statistics, larger than foreign bird weights.

It should be noted that numerous additional unverified bird weights, based on visual observation of birds at the ingestion site, were reported in the current study. Since visual weight estimates are notoriously inaccurate, these weights were not included in the above tables or in any analysis. They can be found, along with a generic bird type identification, in the "BIRDNAME" column of appendix F. The corresponding species and weight columns are empty for these data.

For analytical purposes, each bird weight was assigned a weight class as defined in table 4.6. The initial class ("tiny" birds) includes all weights of 3 ounces or less. The remaining weights were grouped into successive 8-ounce intervals as indicated. For example, the 0.5-pound class contains all weights greater than 3 ounces and less than or equal to 11 ounces. This scheme was chosen because it distinguishes between, and yields intervals "centered" around, 1.5, 2, and 2.5 pounds, weights which are significant in terms of current and proposed certification standards.

The 199 verified bird weights fall into 13 distinct weight classes. Figure 4.2 indicates the frequency of aircraft ingestions of United States, foreign, and unknown origin for each of these weight classes. The vast majority of bird weights are in the smallest three weight classes ("tiny", 0.5 pound, and 1 pound) and relatively few are in the 1.5-pound class. There are, however, a significant number in the 2-pound and 2.5-pound classes. Indeed, the 2.5-pound weight class contains more domestic bird weights (8) than any other class. Six of these events occurred at Kennedy International Airport in New York (68, 98, 263, 323, 451, and 467), one (257) at Los Angeles International Airport, and the other (477) at Newark International Airport. It should be noted that the aforementioned six events at Kennedy Airport are the only ones known to have occurred there; i.e., all reported ingestions at JFK yielded verified bird weights, all of which are in the 2.5-pound weight class.

Figure 4.3(a) plots the cumulative distribution functions (see appendix B) for both United States and foreign bird weights. The two distributions diverge between 10 and 40 ounces, with a larger percentage of foreign bird weights less than 40 ounces. An application of the Kolmogoroff-Smirnov Two-Sample Test (see appendix B) yields P = 5.27 percent which, although not quite statistically significant, is strong evidence that the domestic and foreign bird weight sample distributions are different. (The corresponding distributions were shown to be different by this two-sample test in the previous FAA large engine study, [1].)

Relative frequency histograms for the same two distributions are shown in figure 4.3(b). The weight classes are the same as defined in table 4.6 except that here all weights above 59 ounces are combined into a single (4 pounds and up) class. Disparately higher percentages of domestic weights fall in the 2.5-pound class (driven by the abovementioned 6 events at JFK airport) while the opposite is true for the 0.5-pound and 2-pound weight classes.

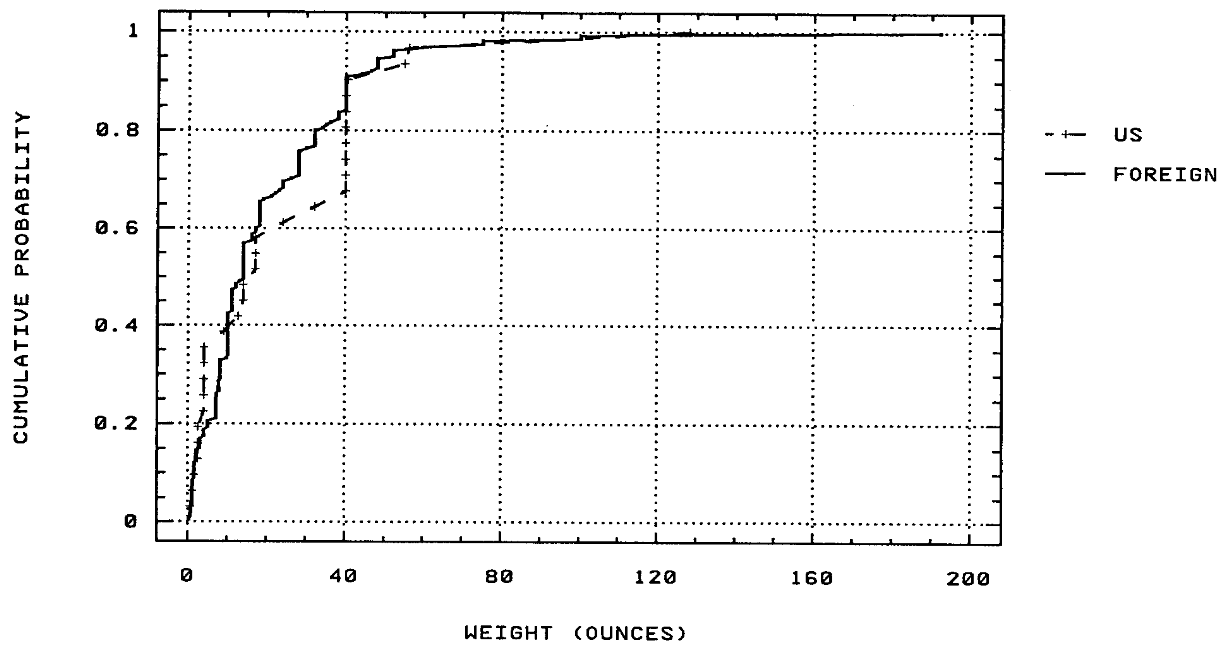
TABLE 4.6 DEFINITION OF BIRD WEIGHT CLASSES

WEIGHT RANGE(oz.)	*WEIGHT CLASS(lbs.)*	*WEIGHT RANGE(oz.)*	*WEIGHT CLASS(lbs.)*
3 or less	*Tiny*	*99+ to 107*	*6.5*
3+ to 11	*0.5*	*107+ to 115*	*7*
11+ to 19	*1*	*115+ to 123*	*7.5*
19+ to 27	*1.5*	*123+ to 131*	*8*
27+ to 35	*2*	*131+ to 139*	*8.5*
35+ to 43	*2.5*	*139+ to 147*	*9*
43+ to 51	*3*	*147+ to 155*	*9.5*
51+ to 59	*3.5*	*155+ to 163*	*10*
59+ to 67	*4*	*163+ to 171*	*10.5*
67+ to 75	*4.5*	*171+ to 179*	*11*
75+ to 83	*5*	*179+ to 187*	*11.5*
83+ to 91	*5.5*	*187+ to 195*	*12*
91+ to 99	*6*		

TABLE 4.7 NUMBER OF BIRDS INGESTED BY BIRD WEIGHT CLASS

NO. BIRDS					*WEIGHT CLASS (LBS.)*					*TOTALS*
	TINY	*0.5*	*1*	*1.5*	*2*	*2.5*	*3*	*3.5*	*4&UP*	
1	*36*	*50*	*28*	*8*	*17*	*23*	*6*	*4*	*8*	*180*
1 OR MORE		*1*								*1*
2		*3*	*6*		*1*	*1*		*1*		*12*
2 OR MORE	*2*	*2*	*2*		*1*	*2*				*9*
3		*3*				*1*				*4*
4		*1*	*2*							*3*
4 TO 5					*1*					*1*
5			*2*							*2*
7			*1*							*1*
6 TO 17		*2*								*2*
UNK NO.			*2*							*2*
TOTALS	*38*	*62*	*43*	*8*	*20*	*27*	*6*	*5*	*8*	*217*

Cumulative (a)



Relative Frequency (b)

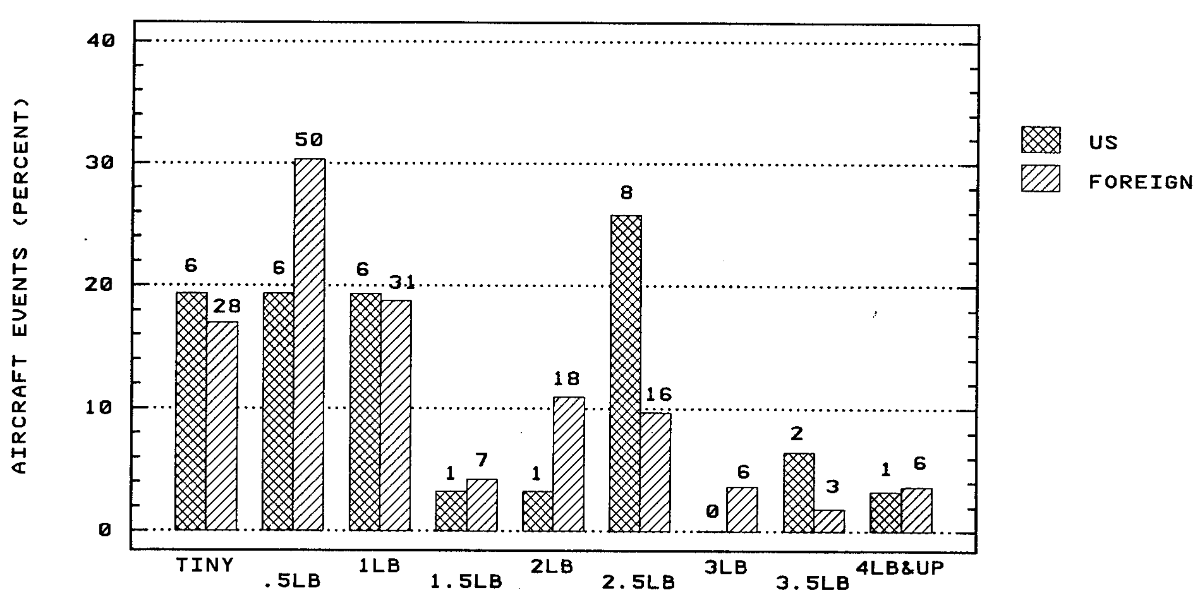


FIGURE 4.3. BIRD WEIGHT DISTRIBUTIONS - US VERSUS FOREIGN

It is of interest to make additional comparisons between bird weights from the current and previous studies. Pairwise plots from each study of the United States, foreign, and worldwide cumulative bird weight distributions are contained in figure 4.4 (a) through (c). Although similarities between corresponding distributions are evident, the Kolmogoroff-Smirnoff Two-Sample Test indicates that the domestic (P = 4.73 percent) and foreign (P = .0003 percent) sample distributions are statistically different.

It is again worthwhile to compare relative frequency histograms. This is done in figures 4.5(a) for domestic, 4.5(b) for foreign, and 4.5(c) for worldwide weights. The same nine weight classes of figure 4.3(b) are used here. In each case, certain similarities are notable. The United States distributions are each bimodal with roughly half the weights in the 1-pound or smaller classes and about 30 percent in the 2.5-pound class. The latter class is strongly influenced by events at JFK airport in both studies. Of the 18 domestic 2.5-pound class events in the 1981-83 study, 8 (all Herring Gulls) are known to have occurred at JFK airport while the airport was undetermined in 4 other events (2 Herring Gulls). Both figures show larger percentages of "tiny" birds for the current study. This could be due to a greater tenacity in collecting and identifying small amounts of bird matter from engines rather than an actual increase in the proportion of smaller birds being ingested. There is also a substantially lower percentage of foreign birds in the 1.5-pound class for the current study. In both studies, the modal weight class is 2.5 pounds for domestic birds and 0.5 pound each for foreign and worldwide birds.

The geographical region in which the aircraft ingestion occurred is known for 172 of the 199 events in which a bird weight was determined. Figure 4.6 plots their frequency according to region for each of the above nine weight classes. Most of the African bird weights fall into the heavier weight classes while the European weights tend to be lighter. North American and European weights are predominate in the 2.5-pound class.

As indicated in section 3, there were 31 multiple-engine and 41 multiple-bird aircraft events, including 12 that fell into both categories. Bird weights, none of which are over 60 ounces, were obtained in 35 of these 60 events. Figure 4.7 contains a frequency distribution of all bird weights up to the 4-pound weight class (so the bars are the same height as the initial portion of figure 4.2). The numbers of single-engine multiple-bird (SEMB), multiple-engine single-bird (MESB) and multiple-engine multiple-bird (MEMB) aircraft events for each weight class are shaded as indicated. The single-engine single-bird events (SESB) remain unshaded. The aforementioned multiple-species event (333) appears as an "MEMB" event in both the "tiny" and 3.5-pound classes. The 0.5-pound and 1-pound classes contain the greatest numbers (12 and 10, respectively) of these "multiple" events. The 2.5-pound class contains 5 of the 9 events in weight classes over 1-pound. The 1.5-pound class has no multiple-engine or multiple-bird events in which species was determined.

Table 4.7 contains a cross tabulation of the estimated number of birds ingested according to weight class for each of the 217 engine ingestions in which a species identification was made. Some estimate of bird numbers was given in all but two cases. The 1-pound and 0.5-pound weight classes contain most incidents where large numbers of birds were ingested. Four engines ingested multiple birds of the 2.5-pound class as did 3 engines for the 2-pound class. As noted above, all 1.5-pound engine ingestions involved only single birds.

United States (a)

Foreign (b)

Worldwide (c)

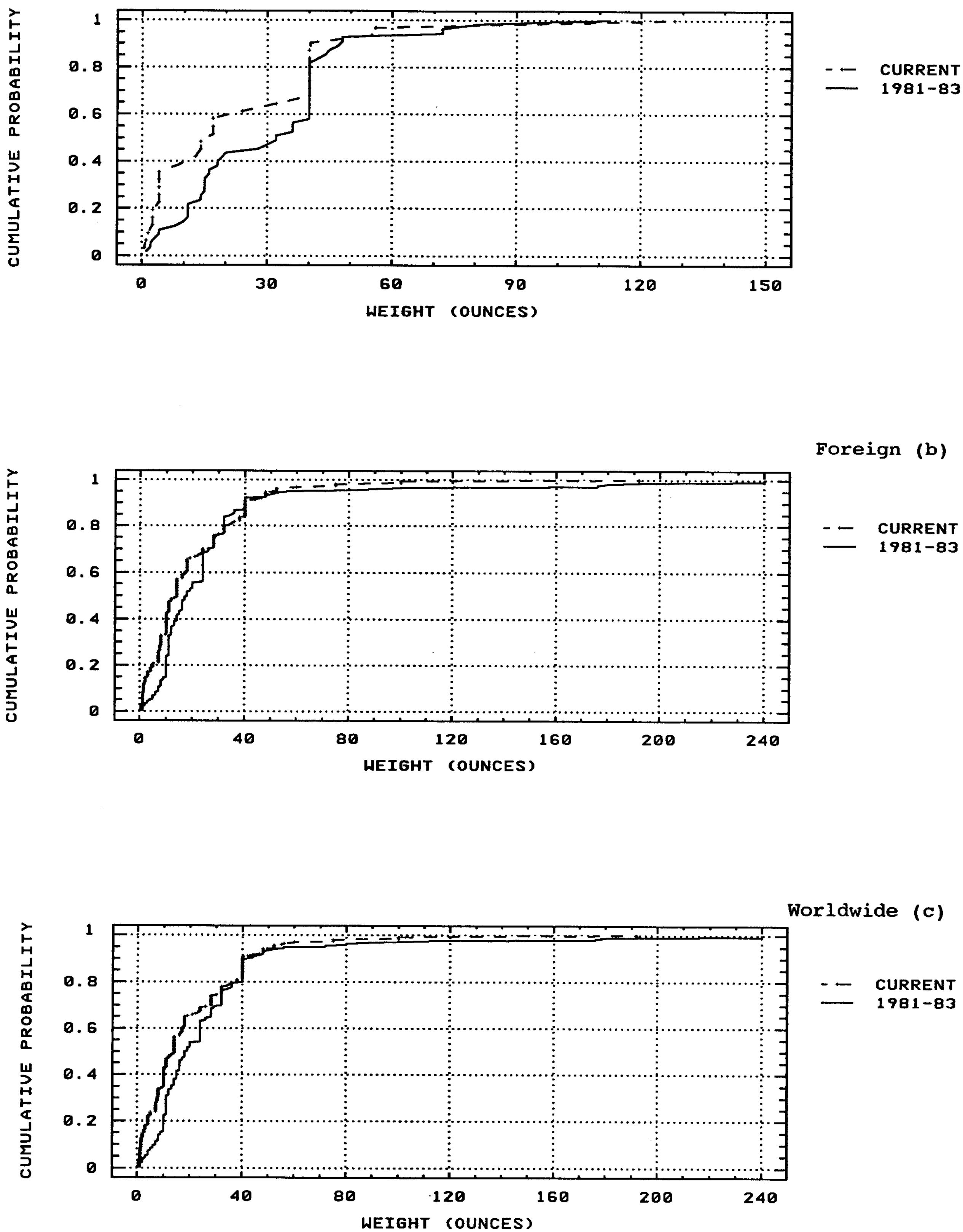


FIGURE 4.4. CUMULATIVE BIRD WEIGHT DISTRIBUTIONS - CURRENT VERSUS 1981-83 STUDY

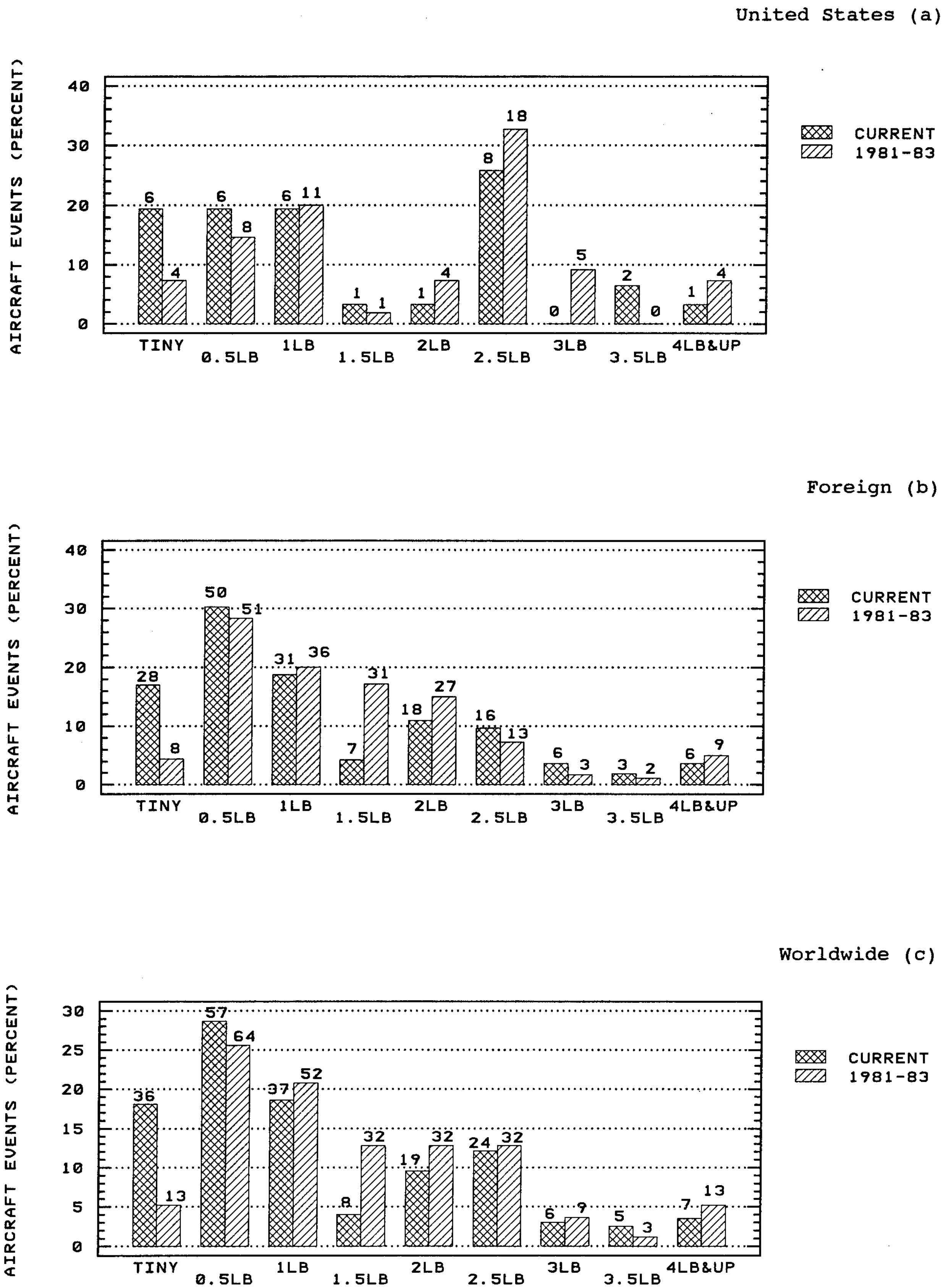


FIGURE 4.5. RELATIVE FREQUENCY BIRD WEIGHT DISTRIBUTIONS - CURRENT VERSUS 1981-83 STUDY

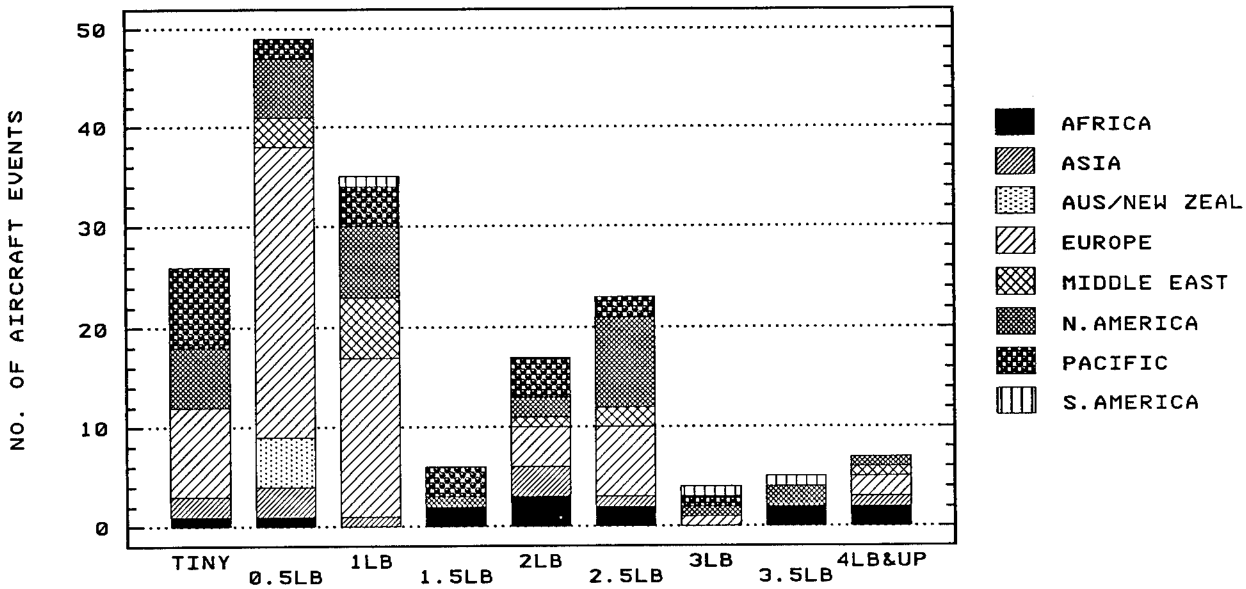


FIGURE 4.6. AIRCRAFT EVENTS BY BIRD WEIGHT CLASS AND REGION

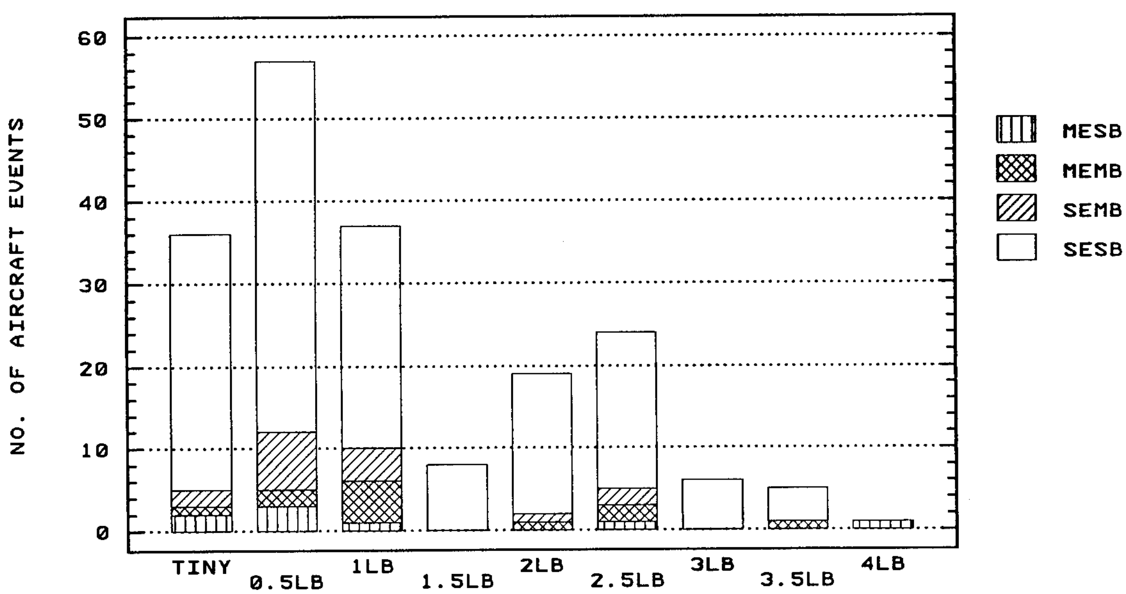


FIGURE 4.7. MULTIPLE-ENGINE AND MULTIPLE-BIRD EVENTS BY BIRD WEIGHT CLASS

It should be noted that the analyses of this section are given in terms of the various sample bird weight distributions that correspond to identified bird species. If it were assumed that each sample weight distribution is a random sample from the respective population of all ingested birds, the results could then be extrapolated to these larger populations. However, evidence from severity of damage to engines, as presented in section 5.8, indicates that this assumption is not valid.

5. ENGINE DAMAGE.

When a bird is ingested into an engine, the first moving part it typically contacts is the fan set. It is usually sliced into pieces by the fan blades, and the resulting matter can go out the bypass ducts or into the primary gas path (core) of the engine. Theoretically, according to the impulse-momentum principle of physics [5], the impulse (integral with respect to time) of the collision force of bird on fan set equals the product of the bird's mass with its striking velocity relative to the fan. For a particular fan set and location of impact, it is this collision force that ultimately determines the stresses, strains, and resulting damage, if any, to the fan blades. These may be nicks, bends, tears, cracks or, in worst cases, pieces of fan blade may break off. Secondary (hard object) damage that can be caused by these pieces is potentially more dangerous to both engine and aircraft than any "soft body" impact between bird matter and machinery.

Thus, all other things being equal, one could expect a direct relationship between "severity" or "extent" of engine damage and mass (weight) of ingested bird. In reality, "all other things" are never quite equal and it is likely that no two bird ingestion events are ever quite the same. There are numerous factors besides bird weight that can influence the effect of a bird ingestion on the engine: the numbers, orientation, and velocity (speed and direction) of the birds; the velocity of the aircraft; the speed and power of the engine; the location and angle of impact; and the engine design. In some cases, a bird is broken up by the inlet cowl and only a portion strikes the fan set. This occurred, for example, in event 118 in which a 12-pound vulture struck the leading edge of the inlet cowl and only a fraction of the bird, believed to be from 1/3 to 1/2, was actually ingested into the engine.

The spanwise location of impact on the fan blade is a critical factor in determining the impact speed of bird with fan, since for a given fan RPM the tangential velocity of the blade increases with distance from the root. Appendix E gives relative speeds of bird and fan set for a typical engine at seven representative phases of flight. For each flight phase, speeds are computed at the fan's root, tip, and at 30 and 70 percent span. In general, speeds at the fan's tip tend to be more than twice those at the root.

5.1 ENGINE DAMAGE CATEGORIES.

Some type of physical damage to the engine was reported in 316 of the 676 engine ingestions (47 percent). In 7 of these events it was determined that the engine damage was not caused by the bird ingestion. In addition, 11 of the engines which had no physical damage experienced, and recovered from, an engine surge. A surge is a potentially hazardous phenomenon that can occur when the primary gas path becomes blocked by bird matter. Surge events are discussed in detail in section 6.1.3.

Fifteen specific categories of engine damage were tracked in the FAA data base and are defined in table 5.1. The data summary in appendix F specifies all of the damage categories which occurred in each engine event. For analytical purposes, each damage category was classified as **minor** or **significant**, as indicated in table 5.1. In general, engine damage was defined to be "significant" if any significant category of damage occurred and "minor" if only

TABLE 5.1 ENGINE DAMAGE CATEGORIES - DEFINITIONS

CATEGORY	DESCRIPTION	CLASSIFICATION
LEADEDGE	FAN BLADE LEADING EDGE DISTORTION	MINOR
BEDE<=3	1 TO 3 BENT/DENTED FAN BLADES	MINOR
TORN< =3	1 TO 3 TORN FAN BLADES	MINOR
SHINGLED	SHINGLED (TWISTED) FAN BLADE(S)	MINOR
ACPAFNAB	ACOUSTIC PANEL OR FAN RUB STRIP DAMAGED	MINOR
NACELLE	ENGINE ENCLOSURE DENTED OR PUNCTURED	MINOR
BEDE>3	MORE THAN 3 FAN BLADES BENT/DENTED	SIGNIFICANT
TORN>3	MORE THAN 3 FAN BLADES TORN	SIGNIFICANT
BROKEN	FAN BLADE LEADING EDGE OR TIP PIECES MISSING	SIGNIFICANT
TRVSFRAC	FAN BLADE BROKEN CHORDWISE, PIECE LIBERATED	SIGNIFICANT
RELEASED	BLADE RETENTION MECHANISM FAILED	SIGNIFICANT
FLANGE	FLANGE SEPARATIONS	SIGNIFICANT
CORE	COMPRESSOR BLADES/VANES DMGD. OR AIRFLOW BLOCKED	SIGNIFICANT
TURBINE	TURBINE DAMAGED	SIGNIFICANT
SPINNER	SPINNER/CAP DAMAGED	SIGNIFICANT

minor damage categories occurred. However, in some cases (See Appendix F), engineering judgment overruled this guideline. As a consequence of these definitions, about 20 percent of engine ingestions resulted in significant damage and 26 percent in minor damage.

5.2 ENGINE DAMAGE BY BIRD MULTIPLICITY.

It is natural to ask whether multiple-bird ingestions caused "greater damage" than single-bird ingestions. Damage categories, as defined above, were assigned in 47 multiple-bird and 589 single-bird engine ingestions. Figure 5.1 is a relative frequency histogram showing the proportions of significant, minor, and no damage for both single- and multiple-bird events. It is evident that the percentage of damage is somewhat higher for multiple-bird ingestions than single-bird ingestions (59.6 percent versus 46.5 percent) and the proportion of significant damage is much greater in multiple-bird ingestions (42.6 percent versus 18.5 percent).

Figure 5.1 also contains the number of ingestions in each damage category for both single- and multiple-bird events. The 3 x 2 contingency table comprised of these numbers has chi-square = 17.9 with df = 2, yielding a *P-value* of 0.01 percent. Hence there is a significant statistical relationship among the factors. (See appendix B for a discussion of the chi-square test.)

As figure 5.1 indicates, 42.6 percent of multiple-bird ingestions caused significant damage while only 18.5 percent of single-bird ingestions did likewise. This suggests combining the counts for "no damage" and "minor damage" in figure 5.1. The resultant 2 x 2 contingency table whose rows represent (1) "significant damage" and (2) "minor or no damage" (and whose columns, again, represent single/multiple bird) has chi-square = 16.1 with df = 1, giving a *P*-value of 0.006 percent (with Yates correction.) Hence the effect of bird multiplicity on significant engine damage is statistically significant. This result formalizes what was evident graphically in figure 5.1. Intuition dictates that two of the defining categories for significant damage, bede>3 and torn>3, would be more prone to occur in multiple- than in single-bird ingestions. It is therefore surprising that these were determining factors for significant engine damage in only 4 out of the 20 multiple-bird ingestions with significant damage.

When, on the other hand, the analogous 2 x 2 contingency table derived from figure 5.1 whose rows represent (1) "damage (of any sort)" and (2) "no damage" is considered, then chi-square = 2.9 with df = 1, yielding P = 8.6 percent. Hence the effect of bird multiplicity on any engine damage is not conclusive.

Engines having only damage unrelated to the bird ingestion or those that surged and recovered but had no physical damage were excluded from the above analysis. Engines sustaining only bird damage described as "within limits" or "serviceable" were assigned to the "minor damage" category. It should be noted that the weight and quantity (if greater than two) of birds were not taken into consideration in these analyses.

5.3 ENGINE DAMAGE BY PHASE OF FLIGHT.

Among the factors previously mentioned which could affect engine damage are engine speed/power and aircraft velocity. Although provision was made in the data base for recording the engine power setting at time of ingestion, this

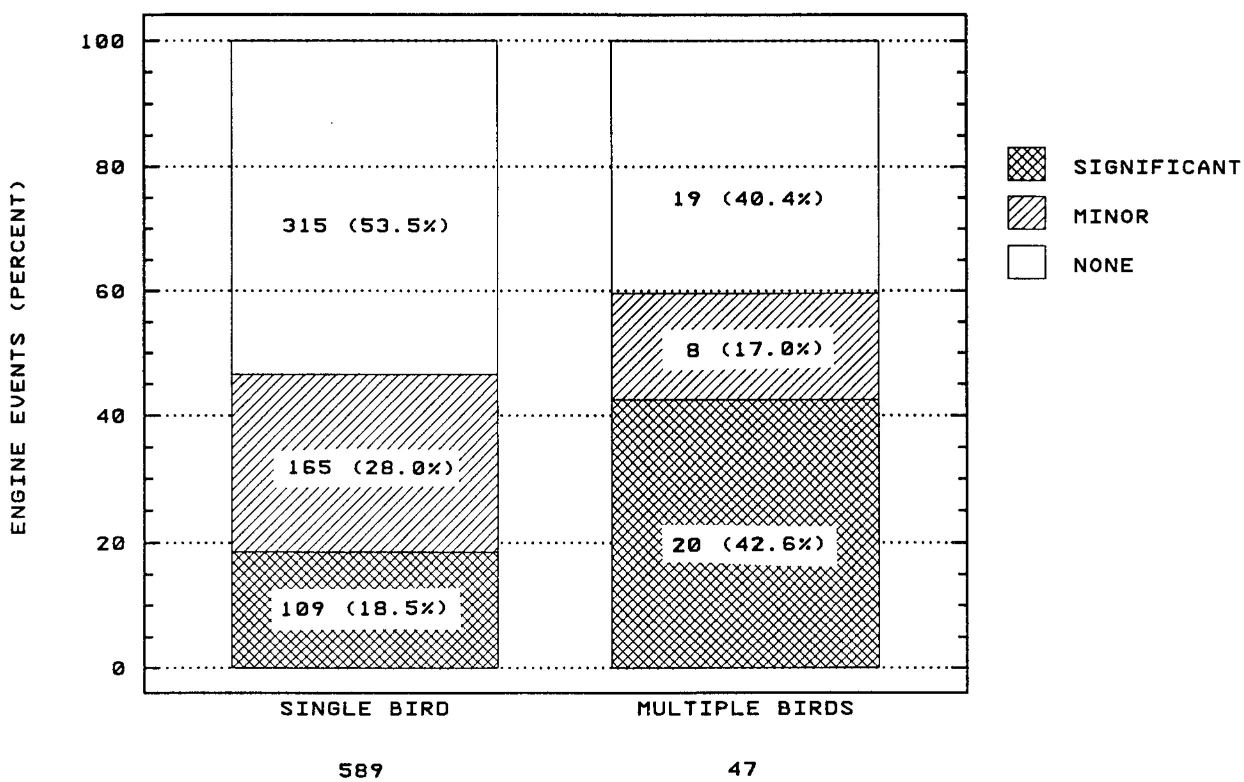


FIGURE 5.1. RELATIVE FREQUENCY OF ENGINE DAMAGE BY SINGLE/MULTIPLE BIRD

information was actually reported in only 13 of the aircraft events, while a numerical aircraft speed was reported only 126 times [Section 3.4.] However, as appendix E illustrates, there is a relationship between each of these factors and the phase of flight of the aircraft. For example, fan RPM is usually over 90 percent of maximum during the takeoff and climb phases, is roughly 65 percent during final approach, and falls below 40 percent during descent and landing. Since, as noted in section 3, some indication of flight phase was reported in nearly 60 percent of the aircraft events, it is natural to examine the relationship between phase of flight and engine damage.

The frequency of significant damage, minor damage, and no damage for each reported category of phase of flight is illustrated in figure 5.2(a) for the 408 engine events in which this information is known. The "takeoff roll," "takeoff" "climb," "approach," "landing," and "landing roll" categories each contain 10 or more damaging events. However, over half of the engine ingestions in each of the latter three categories were nondamaging. This suggests looking at the relative frequencies of damage in each phase of flight category, as shown in figure 5.2(b). The four "takeoff or climb" categories and "thrust reverse" have high percentages of significant or minor damage. However, as figure 5.2(a) indicates, the latter phase contains only eight events. These facts, along with the above remarks concerning fan speed in various phases of flight, suggest grouping phases of flight according to "departure" and "arrival" for analysis of engine damage.

The relative frequency histogram in figure 5.3 indicates the percentages of significant, minor, and no engine damage in each of the two aforementioned phase of flight categories. "Departure" includes all takeoff or climb phases while "arrival" contains the descent, approach, and landing phases. (The 14 "cruise," "reverse," or "taxi" events have been excluded.) It is evident that the proportions of significant and minor damage are much higher for "departure" than "arrival" ingestions.

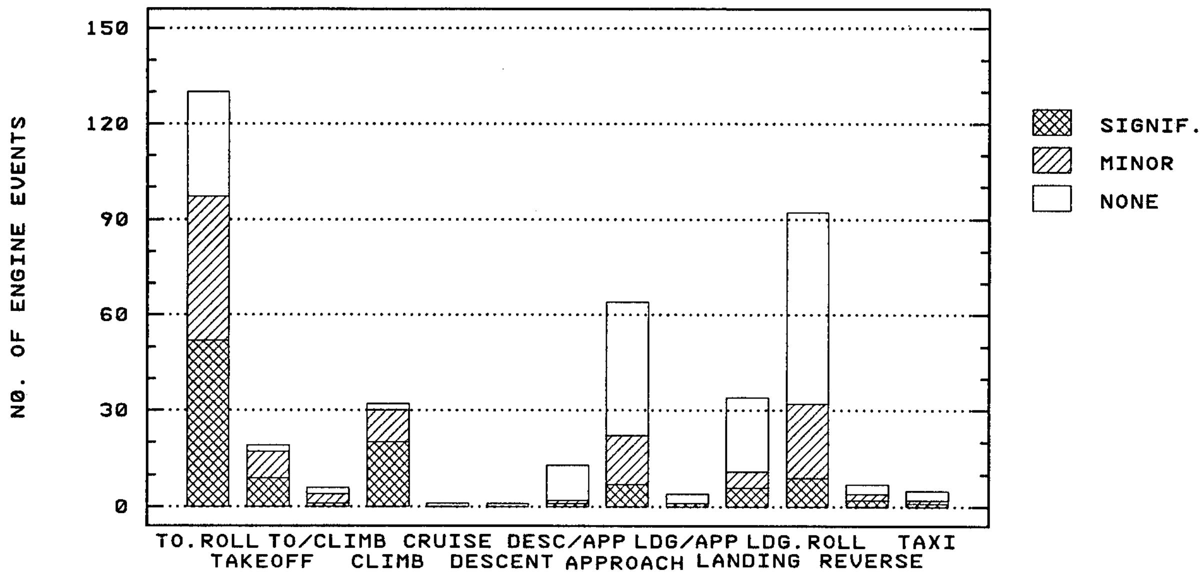
Figure 5.3 also contains the frequency of ingestions in each damage category for both departure and arrival events. The 3 x 2 contingency table consisting of these numbers has chi-square = 90.9 with df = 2, giving a *P*-value of 0 percent. Hence it is a statistical certainty that the factors in figure 5.3 are dependent. Note that about 44 percent of the departure ingestions were significantly damaging while only 21 percent were nondamaging. In contrast, the corresponding proportions for arrivals are 11 percent and 67 percent, respectively.

When the counts for "significant" and "minor" damage from figure 5.3 are combined, the resultant 2 x 2 contingency table whose rows represent (1) "damage (of any sort)" and (2) "no damage", (and whose columns represent departure/arrival) has chi-square = 82.7 with df = 1, giving a *P*-value of 0 percent. On the other hand, the analogous 2 x 2 contingency table derived from figure 5.3 whose rows represent (1) "significant damage" and (2) "minor or no damage" has chi-square = 50.1 with df = 1, which gives a *P*-value of 0 (to 11 decimal places). Therefore phase of flight has a statistically significant effect on both any engine damage and significant engine damage.

5.4 ENGINE DAMAGE BY BIRD WEIGHT.

The relationship between engine damage and weight of ingested birds is examined next. Figure 5.4(a) is a frequency histogram depicting engine damage category according to bird weight class for the 196 engine ingestions in which a species

Frequency (a)



Relative Frequency (b)

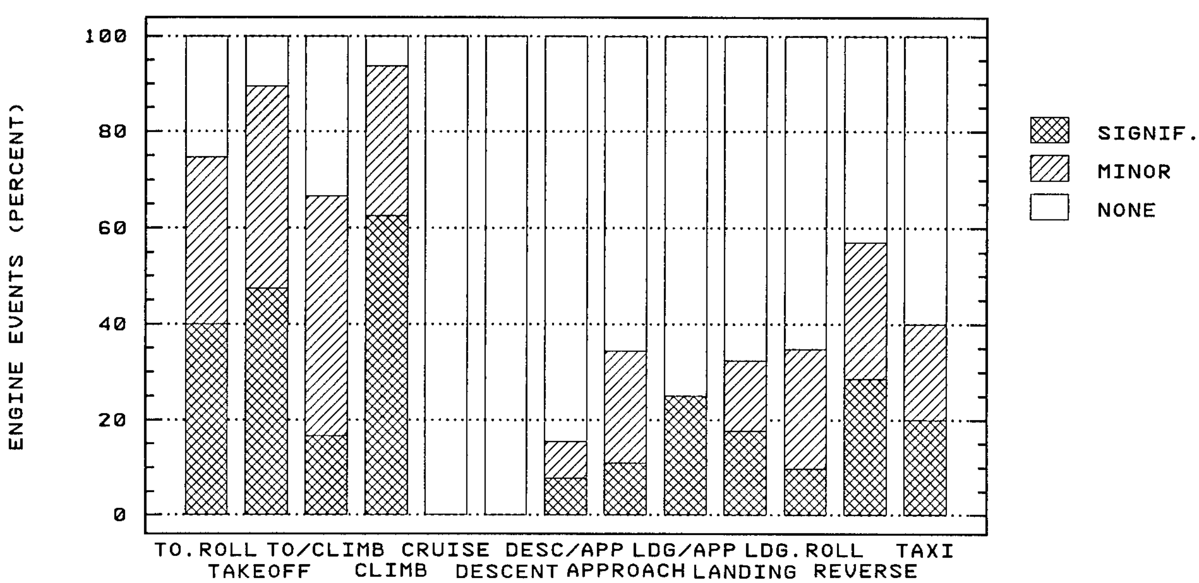


FIGURE 5.2. ENGINE DAMAGE BY PHASE OF FLIGHT

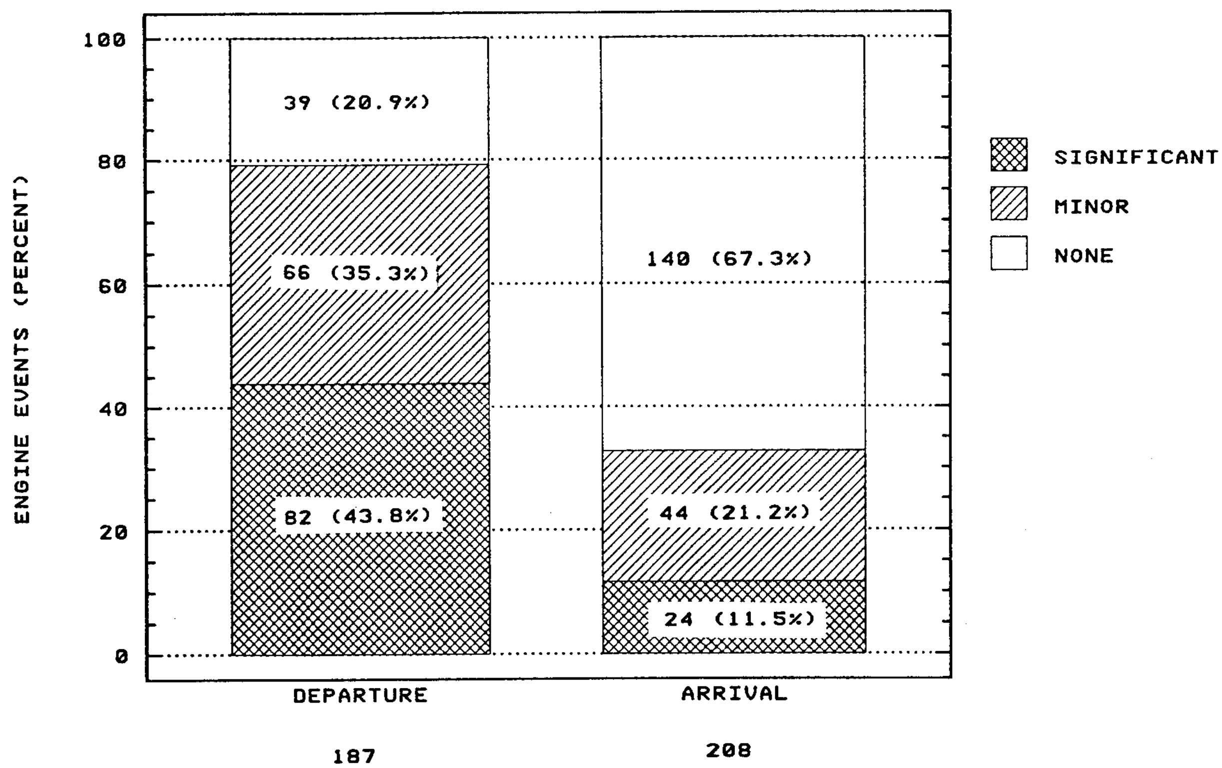
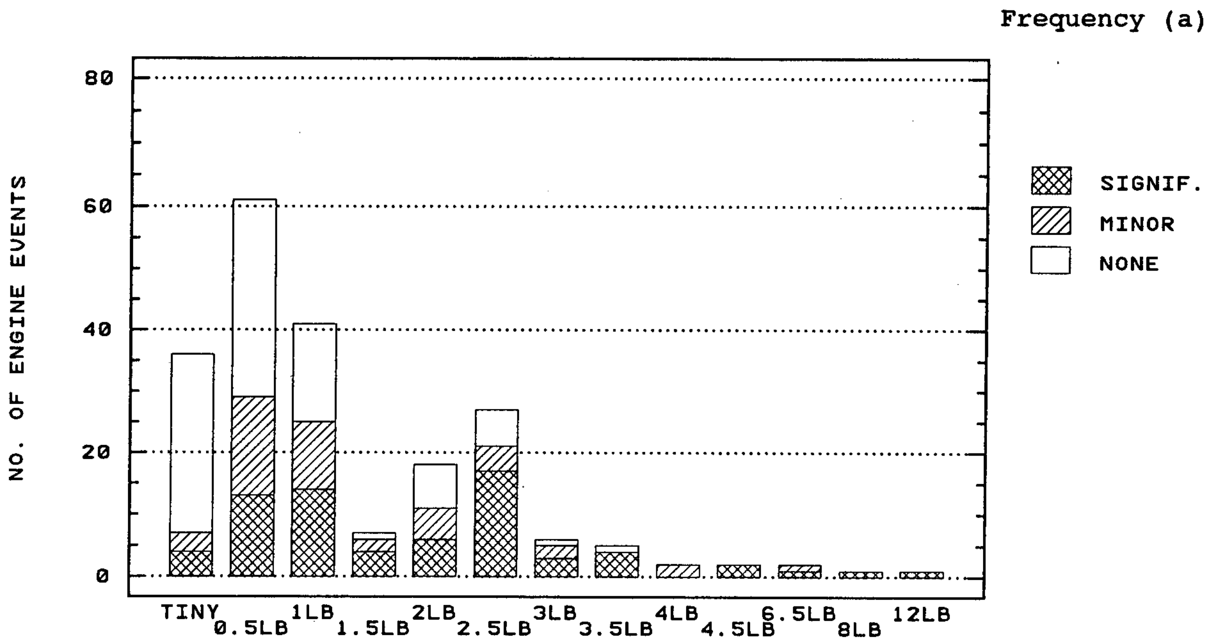


FIGURE 5.3. RELATIVE FREQUENCY OF ENGINE DAMAGE BY DEPARTURE/ARRIVAL



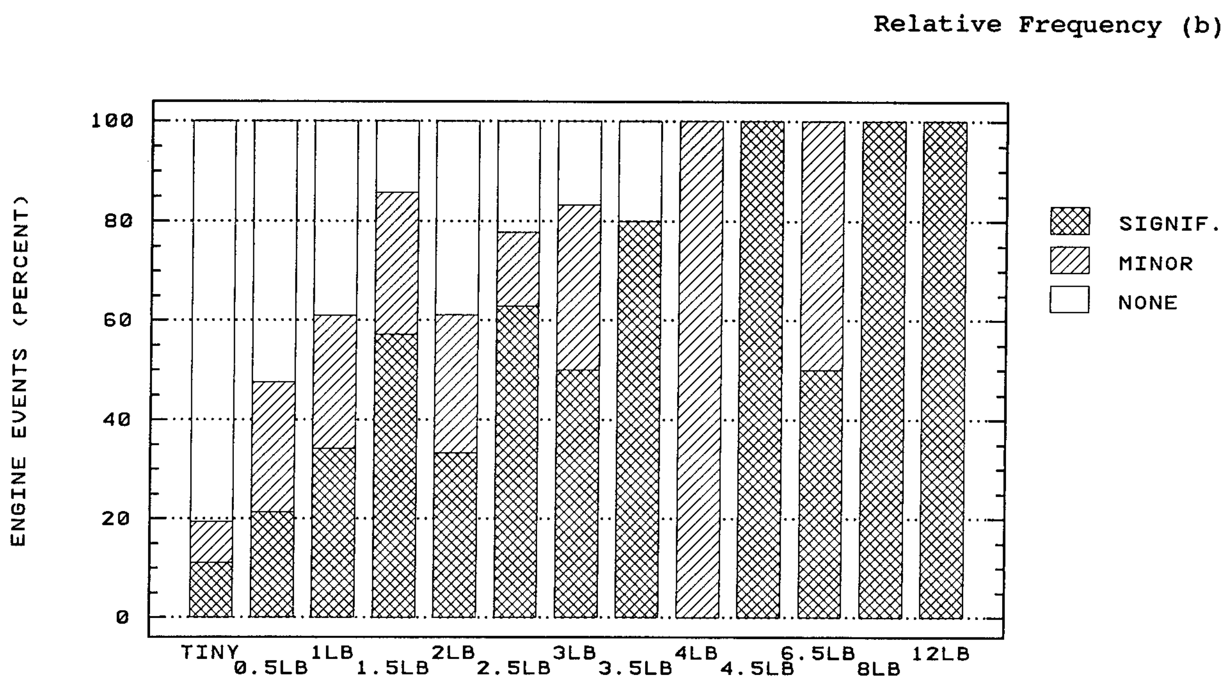


FIGURE 5.4. ENGINE DAMAGE BY BIRD WEIGHT CLASS

identification was made and a damage category assigned. The weight classes are the same as in section 4, as defined in table 4.5. The frequency of engine ingestions that resulted in no damage, minor damage, and significant damage is shown for each weight class. The corresponding relative frequencies are illustrated in figure 5.4(b). The 2.5-pound weight class had the greatest number of events with significant damage. All but 2 ingestions in the 3-pound class or greater were damaging, for the most part significantly. The 0.5-pound class contains the largest number of damaging ingestions but more than half in this class were nondamaging, as were more than 80 percent of all "tiny" bird ingestions. It is evident from figure 5.4(b) that, with few exceptions, the overall trend is for the relative frequency of both damaging and significantly damaging ingestions to increase with bird weight.

In [2], a logistic model is used for the probability of various "severities" of damage as a function of bird weight. Specifically, the logarithm of the odds ratio, log (probability/(1-probability)), is modeled as a linear function of bird weight. A rationale for choosing this particular model is also presented there. The same computer program used in [2], which also generates a mean probability and lower 95 percent confidence bound, was applied to the data in this report. The resultant probability of damage (respectively significant damage) curves are given in figure 5.5(a) (respectively figure 5.5(b)). The mean probability of damage reaches 50 percent at about 9 ounces and the mean probability of significant damage curve does likewise at 29 ounces. No factors other than bird weight were used to generate the curves in figures 5.5(a) and 5.5(b). In particular, the phase of flight and the number of birds ingested were not considered. These are addressed in the subsequent sections.

5.5 ENGINE DAMAGE BY BIRD WEIGHT AND PHASE OF FLIGHT.

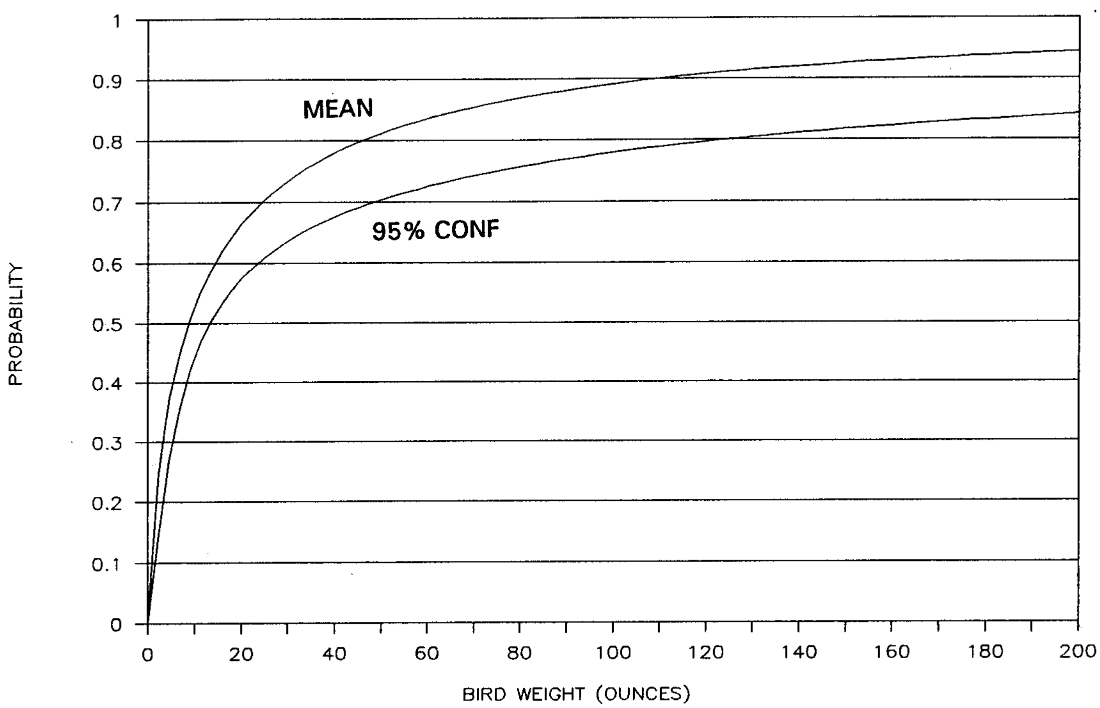
It was shown in the previous two sections how bird weight and phase of flight, each taken separately, influence engine damage. In this section the data are examined to shed light on the concurrent effects of bird weight and flight phase on engine damage.

A species identification was made and a damage category assigned for 87 engine events that occurred during some departure phase of flight. Figure 5.6(a) is a frequency histogram of engine damage category by bird weight class for these events, while figure 5.6(b) shows the corresponding relative frequencies. In these figures, the four weights above 59 ounces are assigned a single "4 pounds and up" weight class. Only 9 events, primarily in the 0.5-pound and 1-pound weight classes were nondamaging. Over 40 percent of the ingestions in the 0.5-pound class were significantly damaging as were at least half in every other weight class.

Figures 5.7(a) and 5.7(b) are histograms showing engine damage category by bird weight class for ingestions that occurred during an arrival phase of flight. As usual, the first figure gives frequency counts and the latter percentages for each weight class. Data is extant for 74 engine ingestions, 49 of which were nondamaging and only 9 significantly damaging. Figure 5.7(b) indicates a fairly reasonable correlation of both damage and significant damage with bird weight. The 100 percent damage rate for the 1.5-pound weight class is based on only one ingestion.

As the figures of this section indicate, bird weight alone is not a sufficient

Any Damage (a)



Significant Damage (b)

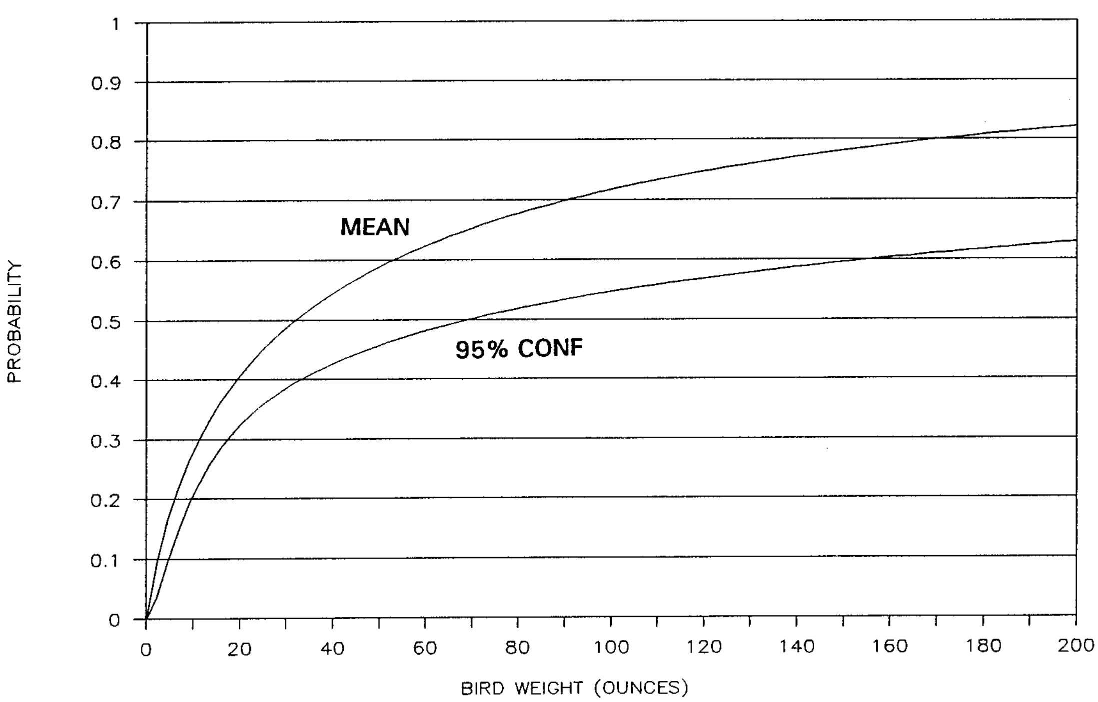
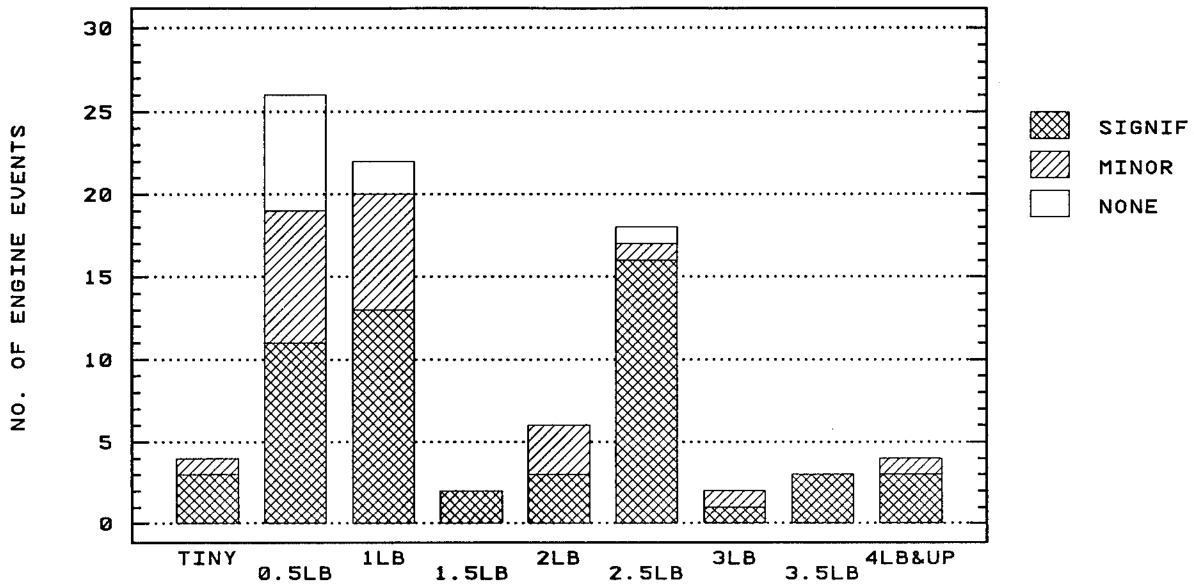


FIGURE 5.5. PROBABILITY OF ENGINE DAMAGE BY BIRD WEIGHT – LINEAR LOGISTIC MODEL

Frequency (a)



Relative Frequency (b)

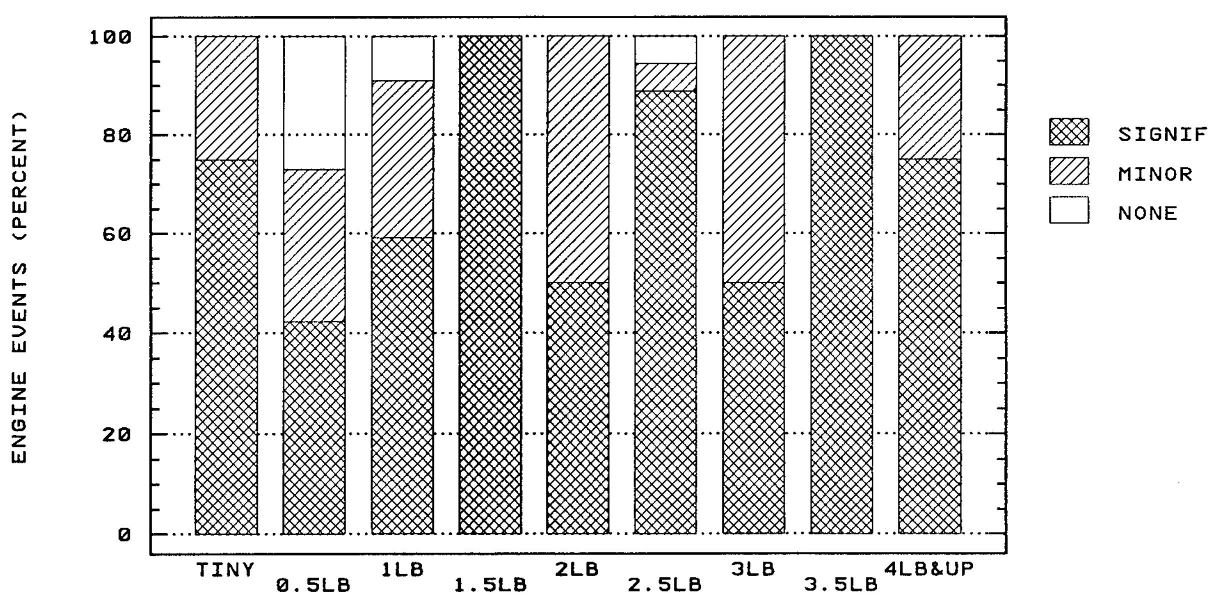
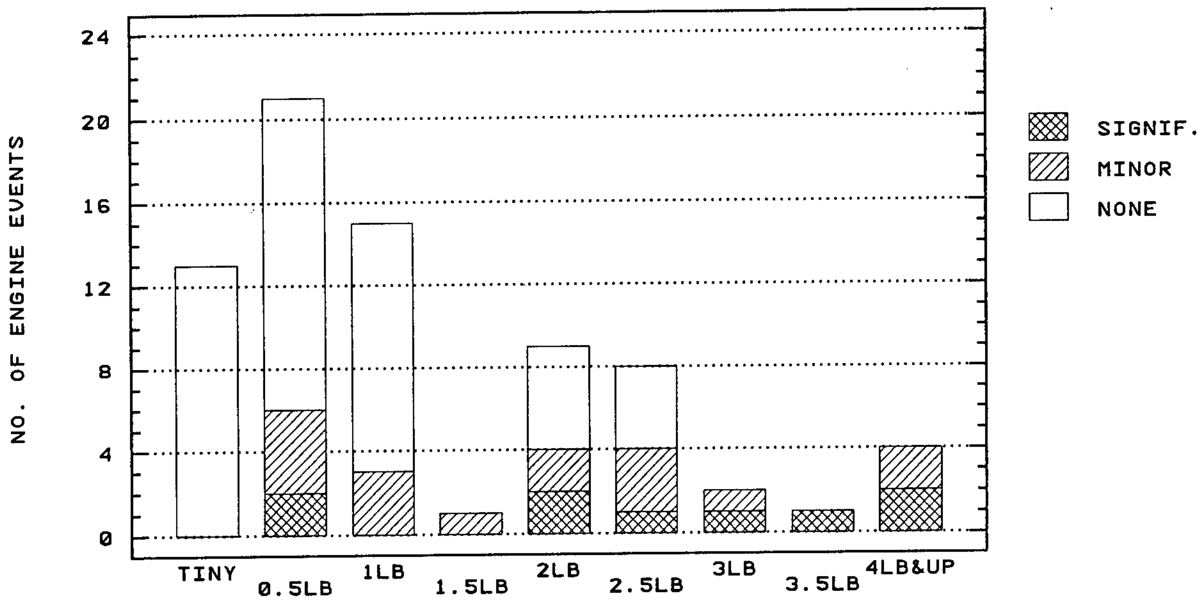


FIGURE 5.6. ENGINE DAMAGE BY BIRD WEIGHT CLASS - DEPARTURES

Frequency (a)



Relative Frequency (b)

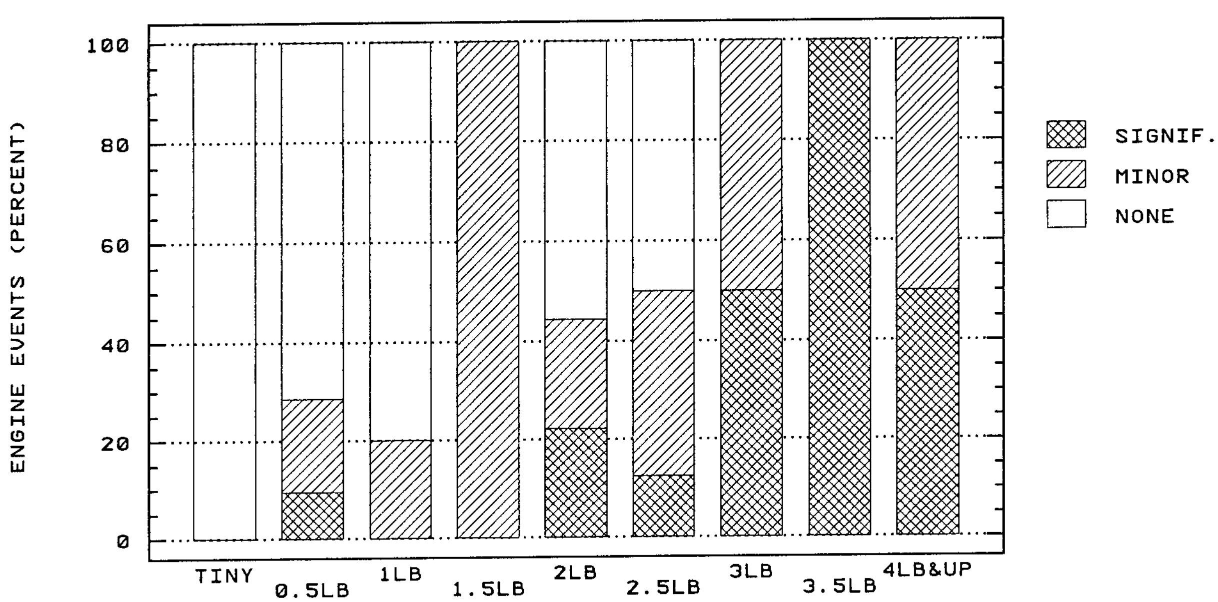


FIGURE 5.7. ENGINE DAMAGE BY BIRD WEIGHT CLASS - ARRIVALS

indicator of engine damage. The phase of flight should also be considered in any such analysis.

5.6 ENGINE DAMAGE BY BIRD WEIGHT, PHASE OF FLIGHT, AND BIRD MULTIPLICITY.

The previous sections indicated that phase of flight, bird weight, and, to some extent, bird multiplicity influence engine damage. In this section optimal logistic regression models (appendix B) are fitted for the probability of both engine damage and significant engine damage as functions of these predictor variables (bird weight, phase of flight, and bird multiplicity.) The effects of all three predictor variables are considered simultaneously. The 164 engine events for which data are complete for all the variables are used in the modeling. The software utilized to fit the models is version 3.1 of "S-PLUS".

It was shown in section 5.2 that bird multiplicity alone is not a statistically significant factor in causing engine damage. It is therefore not surprising that flight phase and bird weight were statistically significant predictors in the logistic regression model for any engine damage but bird multiplicity was not. Figure 5.8 summarizes graphically the results for this model. The figure contains plots of the mean curves for the probability of engine damage by bird weight for departures and arrivals, as well as lower 95 percent and 99 percent confidence curves for each case. The probability of damage during departure is over 65 percent for even the smallest birds and reaches 90 percent at about 20 ounces. In contrast, the mean curve for probability of damage during arrival attains only 50 percent at about 2 pounds and 90 percent at four pounds.

All three predictors were statistically significant in the model for significant engine damage. The mean curves for the probability of significant engine damage by bird weight for each of the four combinations of flight phase and bird multiplicity are given in figure 5.9, while the 95 percent and 99 percent lower confidence curves are plotted separately with each mean curve in figure 5.10. The probability of significant damage is over 60 percent for multiple-bird ingestions during departure involving even the smallest birds and climbs to 90 percent for two-pound birds. The mean curve for single-bird ingestions on departure reaches 50 percent at about one pound and 90 percent at four pounds. The corresponding curves for arrival ingestions reach 50 percent at about three pounds (multiple birds) and six pounds (single birds). As figure 5.10 indicates, confidence in the modeling results is weaker in the arrival cases than for departures.

5.7 ENGINE DAMAGE BY DOMESTIC/FOREIGN.

As noted in section 3.2, the foreign ingestion rate is more than 3.5 times the domestic rate. It is conceivable that some of this disparity is due to under-reporting of bird ingestions by domestic operators vis-a-vis their foreign counterparts. Figure 5.11 compares the frequencies of significant, minor, and no engine damage for domestic and foreign engine ingestions. The percentage of significant damage in United States events is over twice that for foreign. A *P*-value of 0.02 percent for the corresponding 2 x 2 contingency table indicates that this greater propensity for significant damage in domestic events is not due to chance. The proportion of engines sustaining damage (of any sort) is also greater in domestic (67.2 percent) than in foreign (45.3 percent) events. The associated 2 x 2 contingency table which compares frequencies of engine damage

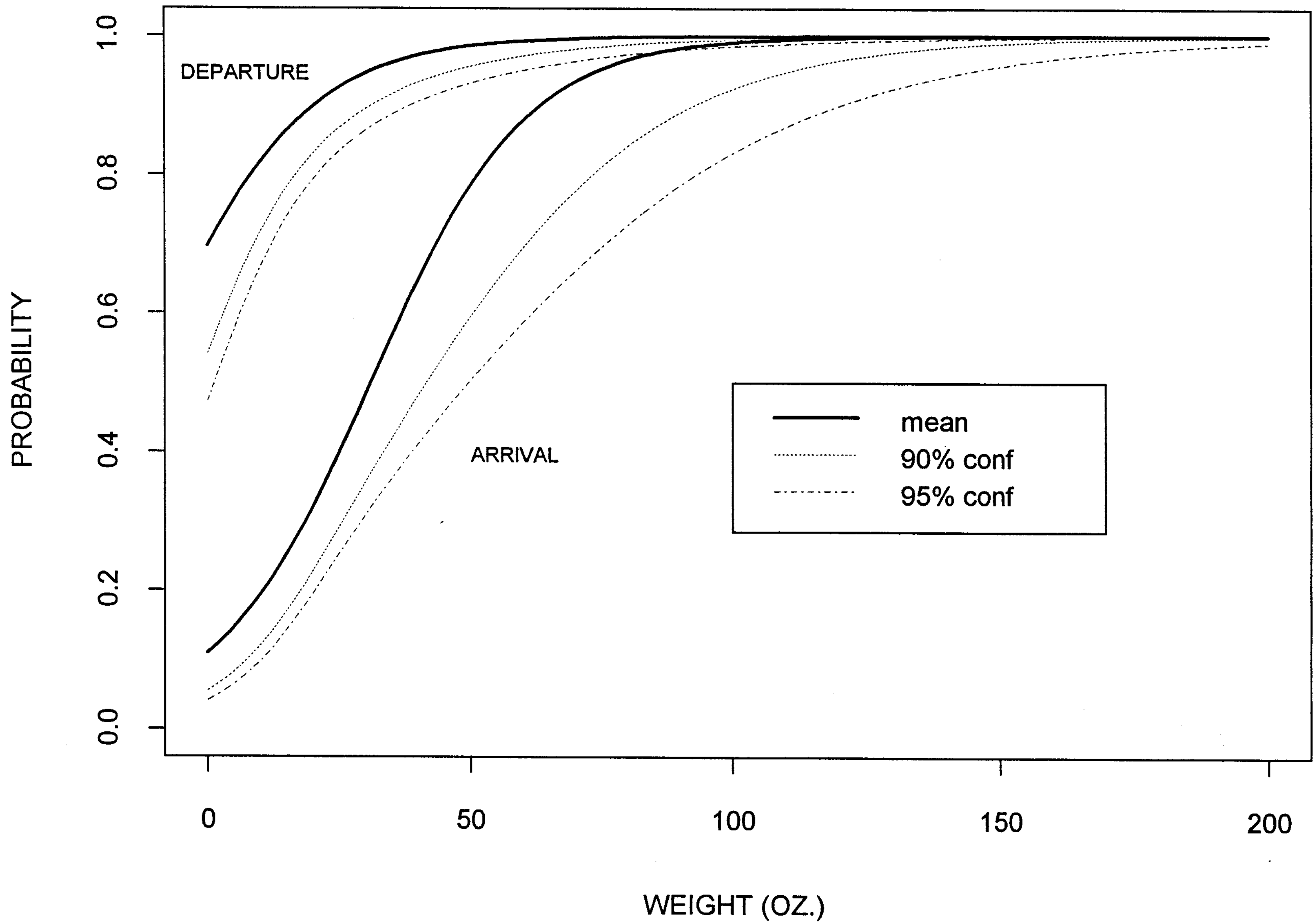


FIGURE 5.8. PROBABILITY OF ENGINE DAMAGE - LOGISTIC REGRESSION MODEL

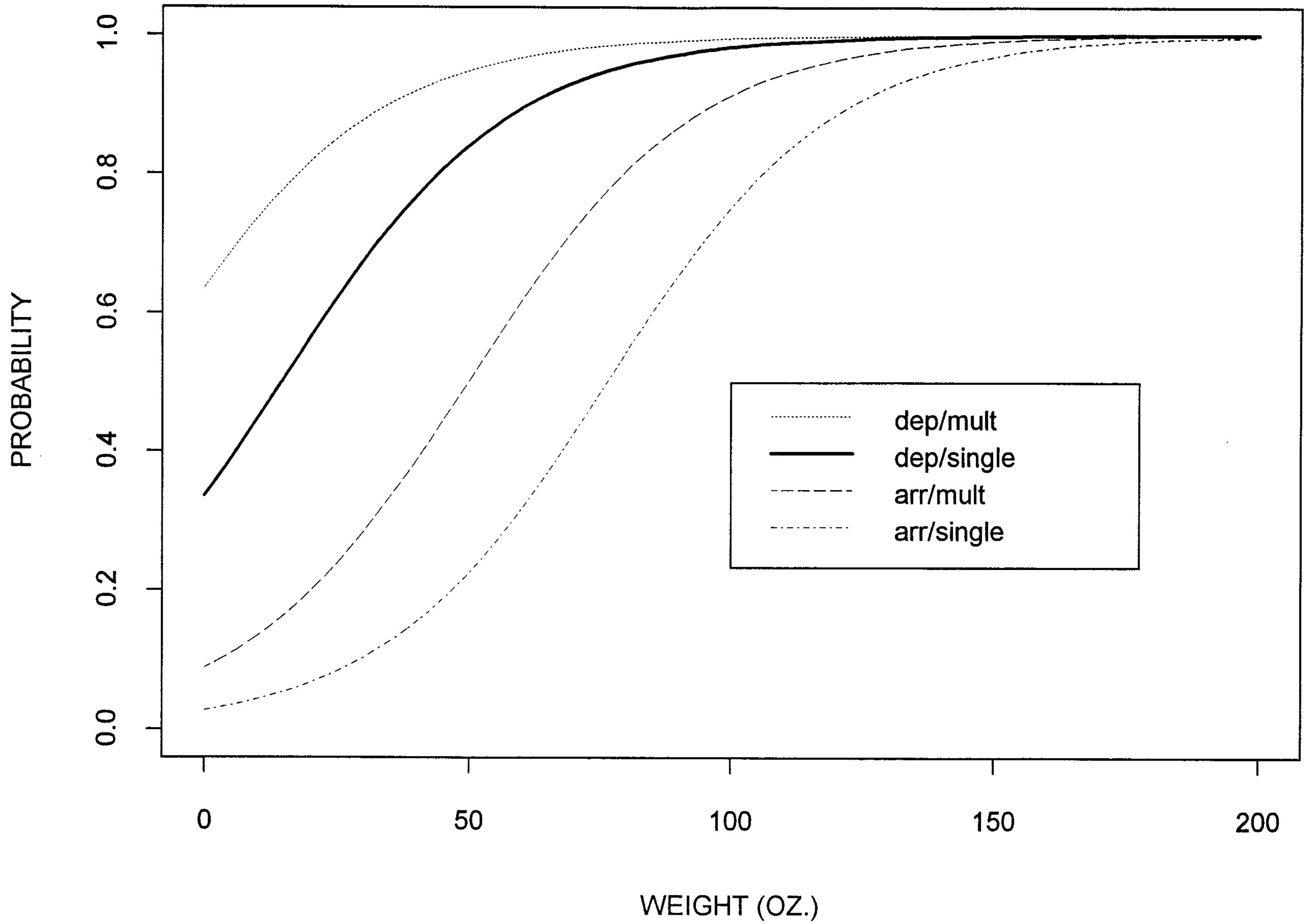


FIGURE 5.9. PROBABILITY OF SIGNIFICANT ENGINE DAMAGE - LOGISTIC REGRESSION MODEL MEAN CURVES

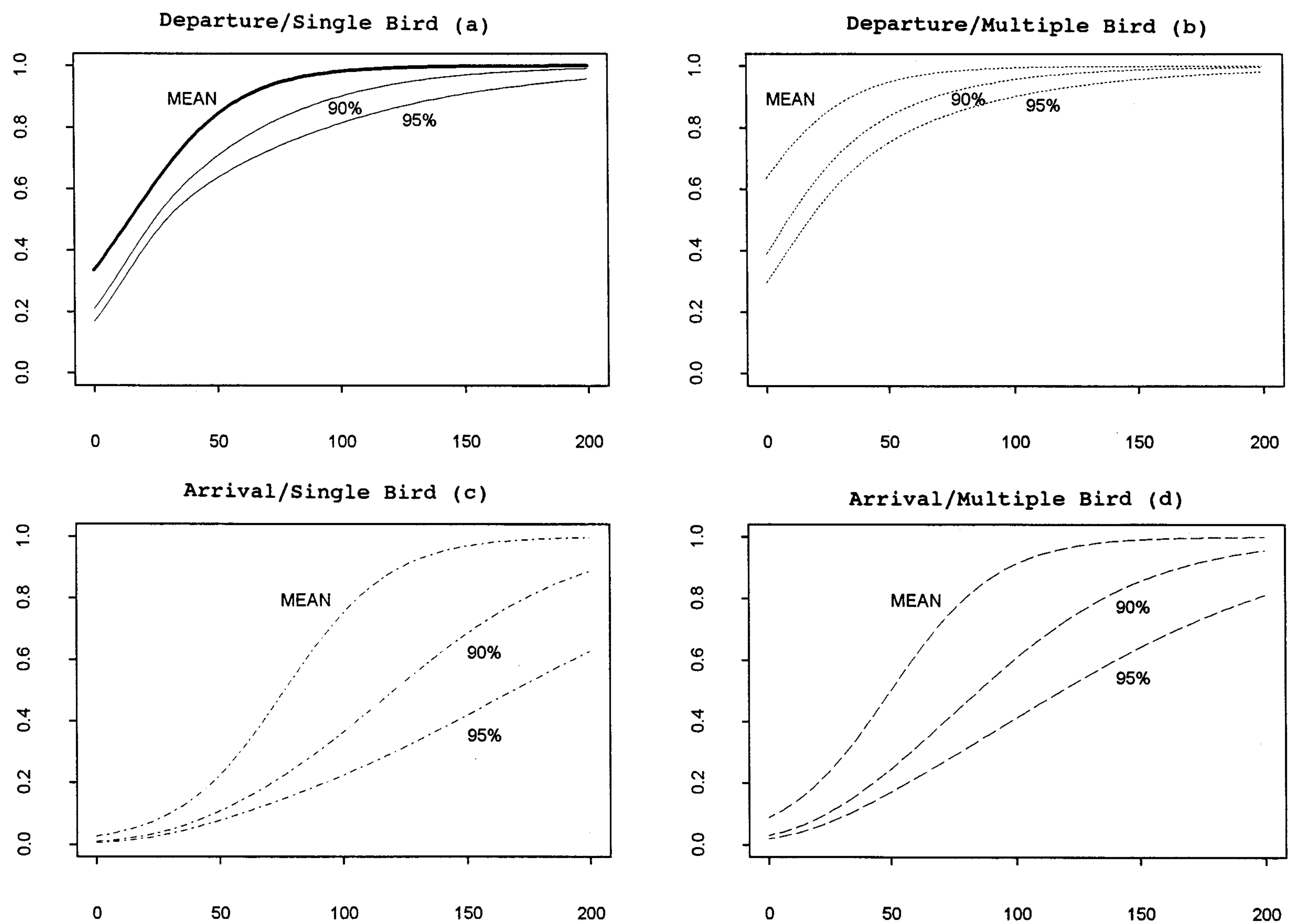


FIGURE 5.10. PROBABILITY OF SIGNIFICANT ENGINE DAMAGE - LOGISTIC REGRESSION MODEL - LOWER CONFIDENCE CURVES

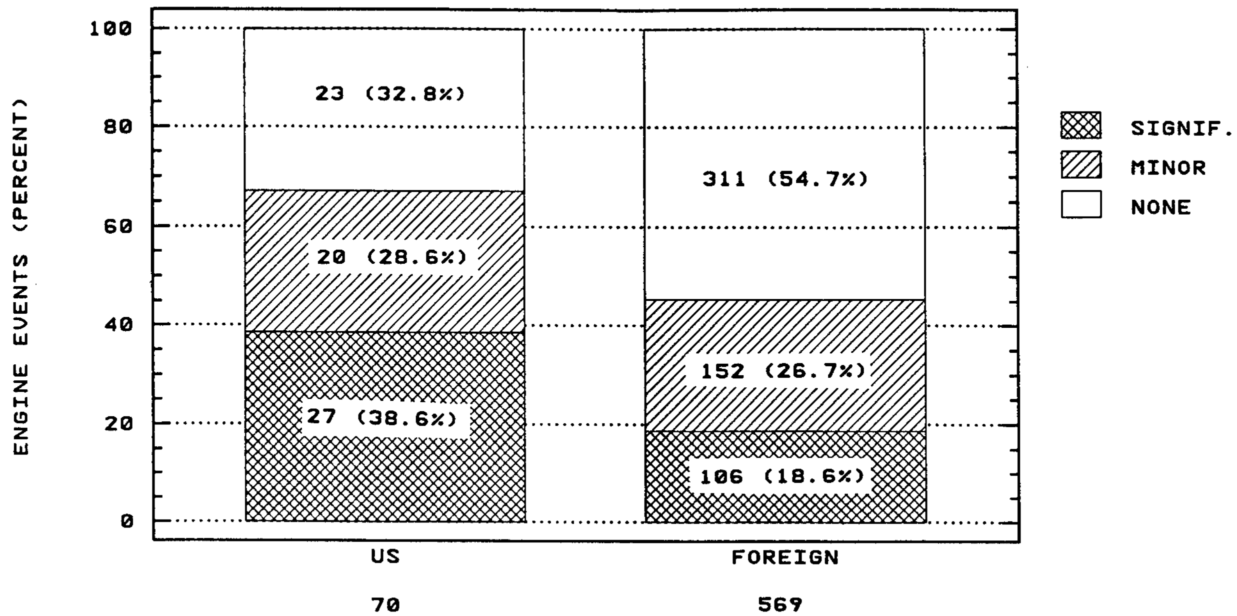


FIGURE 5.11. RELATIVE FREQUENCY OF ENGINE DAMAGE BY US/FOREIGN

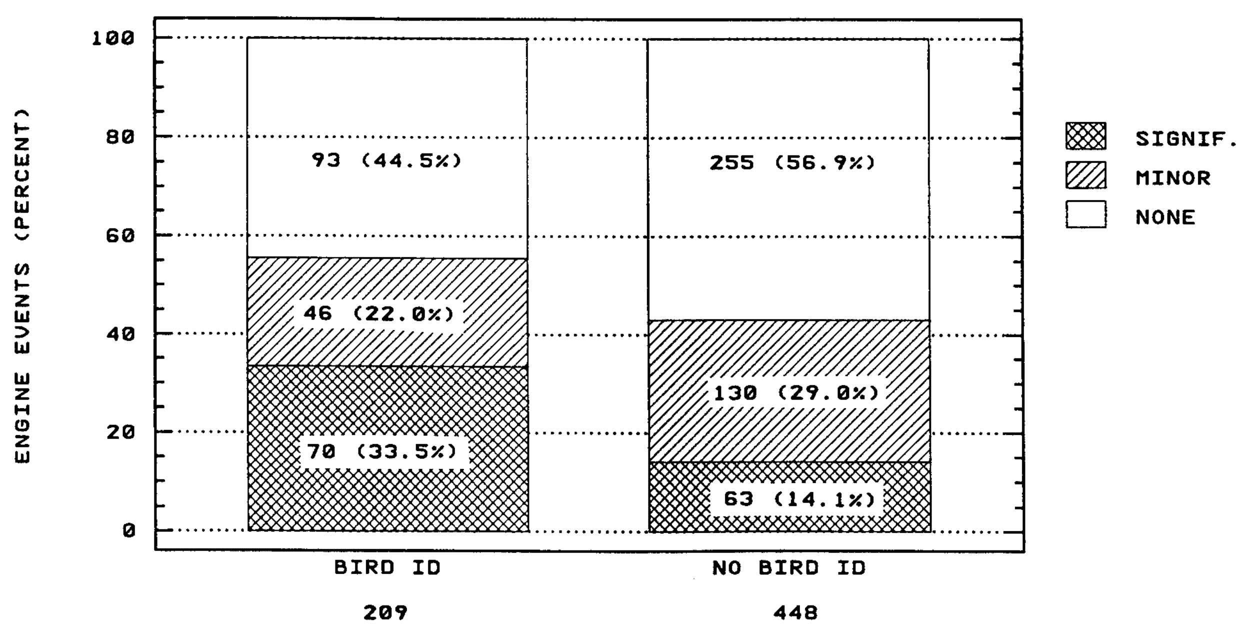


FIGURE 5.12. RELATIVE FREQUENCY OF ENGINE DAMAGE BY BIRD SPECIES IDENTIFICATION

versus no damage for domestic and foreign events has a *P*-value of 0.09 percent. Since it is likely that unreported events would tend to have less severe damage or be nondamaging, one explanation for these results is that a greater percentage of domestic events were indeed unreported compared to foreign.

In order to estimate the extent that domestic events were underreported, it was assumed that the number of US engine events with significant damage (27) is correct and that the proportions of significant, minor, and no damage are the same for domestic as for foreign events (18.6, 26.7 and 54.7 percent, respectively.) It follows that there should have been 79.2 nondamaging and 38.7 minor damaging domestic events giving a projected total of 144.9 US engine events, as against 70 observed.

To take into account the sampling variability of these counts, confidence intervals with 95 percent confidence level were computed based on the assumption that each count is Poisson distributed [2]. The corrected numbers for the US [see Appendix B] are 79.2 non-damaging events with a confidence interval of 44.6 to 133.8 (23 reported), 38.7 minor damage events with the interval 21.2 to 56.2 (20 reported) and an interval for significant damage of 16.8 to 37.2 (27 reported.) The corrected US total is 144.9 events with an interval of 84.8 to 205 (70 reported.) Thus it is unlikely that domestic engine events were underreported relative to foreign by less than 20 percent (84.8/70). The best estimate is that underreporting is over 100 percent (144.9/70) but may be 200 percent (205/70) or higher.

5.8 ENGINE DAMAGE BY BIRD SPECIES IDENTIFICATION.

As noted in section 4.3, the results therein are valid only for the various sample bird weight distributions that correspond to identified bird species. If the sample of events having bird species (and hence verified bird weights) were a random sample from all ingestion events, there would be no reason to expect statistically significant differences between the severities of damage in engines for which bird species were determined versus those for which no bird identification was made.

Figure 5.12 compares the relative frequencies of significant, minor, and no engine damage for engine events having species identification with engine events where no bird identification was made. The proportion of significant damage is 33.5 percent in the former case and only 14.1 percent in the latter. The chi-square test statistic is 32.1 on 1 df, giving a *P*-value of 1.44 x 10^-8. This is a strong indication that the greater proportion of significant damage in engines where species were determined is not due to chance. For engines having bird identifications, 55.5 percent had some engine damage, versus 43.1 percent in engines without species identification. The corresponding chi-square test statistic is 8.36 on 1 df, giving a *P*-value of 0.0039 and indicating that the greater proportion of damage in engines having species identification is statistically significant. The evidence thus suggests that severity of engine damage was a factor in determining whether feathers were recovered and species identified and that the resultant sample of verified bird weights is not a random sample from the population of all ingested bird weights.

6. ENGINE DAMAGE REVISITED - CORE VERSUS FAN DAMAGE.

As previously noted, an ingested bird typically collides with some portion of the engine's fan set where it is sliced into pieces. The resultant bird matter can go out the bypass or into the main gas path (core) of the engine. In the previous section each incident of engine damage was classified as "minor" or "significant" for purposes of analysis. This classification, and the results emanating therefrom, did not differentiate between damage to the fan blades or the core, or to other ancillary types of engine damage (struts, casing, outlet guide vanes, acoustic liners, etc.). In order to gain further insight into the effects of bird ingestion on an engine, damage to the fan blades and the core are considered separately in this section. The various types of core damage and the circumstances in which they occur are treated first. In the latter part of this section, fan blade damage is examined from a fresh perspective in order to more directly characterize the effects of bird ingestion.

6.1 CORE DAMAGE.

Core ingestions are sometimes indicated by cockpit symptoms (smell of burning flesh, a loud bang) and are usually confirmed by boroscope inspection. The bypass ratios for engines in this study range from 4.1 to 6.0 (table 2.1). This suggests that roughly 20 percent of single-bird ingestions would involve the core. When more than one bird is ingested into an engine the probability of a core ingestion increases dramatically. One hundred eighty-three of the 676 engine ingestions (27 percent) resulted in some bird matter in the core. The corresponding proportion was 64 percent for multiple-bird engine events.

6.1.1 Core Damage Categories.

Bird matter which has been sliced by the fan enters the primary gas path at the low-pressure compressor. There it is transformed into a fluid and the resultant mass typically travels through the successive compressor stages to the combustor section. Bird debris can block the primary gas path flow and a "surge" occurs. Symptoms of an engine surge can be a loud bang, flames from the tailpipe, and a momentary reduction in power. The blockage is usually expelled and normal engine power is regained, but in some cases the engine can fail to recover power ("nonrecoverable surge".) A surge need not be accompanied by any physical engine damage. Indeed, 13 such events were reported, all of which were excluded from the engine damage analysis in section 5.

Sixty-one engine ingestions resulted in some physical core damage, in all cases to compressors. There were an additional 26 events in which an engine surged but no core damage occurred. Six mutually exclusive categories of core damage are defined in table 6.1. The order is hierarchal, i.e., an engine event falls into the first appropriate category and no other. A blade/vane clash occurs when the leading edges of compressor blades come into contact with the trailing edges of stator vanes. It is a potentially hazardous condition usually accompanied by engine surges. Although core damage of any kind typically necessitates an engine change, minor nicks or bends to compressor blades or vanes sometimes have no discernable effect on engine performance and can go undetected for some time. Such prior core damage was discovered 6 times upon examination of an engine following a birdstrike.

TABLE 6.1 CORE DAMAGE CATEGORIES - DEFINITIONS

CATEGORY	*DESCRIPTION*
BLADE/VANE	*CONTACT BETWEEN COMPRESSOR BLADES & STATOR VANES*
BROKEN	*COMPRESSOR BLADE BROKEN*
BENT>3	*>3 OR MULTI-STAGE COMPRESSOR BLADES/VANES BENT; TORN OR CRACKED BLADES*
BENT<=3	*UP TO 3 BENT OR SHINGLED COMPRESSOR BLADES/VANES IN A SINGLE STAGE*
UNKNOWN	*SOME COMPRESSOR DAMAGE, BUT OF UNKNOWN TYPE OR EXTENT*
SURGE	*ENGINE SURGE; NO PHYSICAL CORE DAMAGE*

6.1.2 Core Damage by Phase of Flight.

As with fan sets, rotation speeds of compressors typically vary with flight phase. In any compressor, all departure RPM's exceed all arrival RPM's. Figure 6.1 plots the frequency of occurrence of each core damage category according to phase of flight. Most of the "bent blades only" events occurred during arrival, in 6 of which the blades were described as "within limits". All of the "surge only" events took place during departure. The phase of flight is unknown in 10 of the 16 "broken blade" events. One of the "blade/vane" departure events also had broken compressor blades resulting from vane contact (event 32). The rationale for placing "blade/vane" before "broken" in the core damage hierarchy in table 6.1 was provided by this event and the fact that no other engine ingestions sustained both kinds of damage. The lone arrival "blade/vane" event (119) occurred on final approach, when engine power is greater than during descent or landing. There was no in-flight engine surge for this event. The engine did surge, however, when subsequently tested on the ground at high power. The phase of flight is known in 59 of the 101 core ingestions where no core damage or surge occurred: 27 were departure events, 31 were arrivals, and one occurred during thrust reversal.

6.1.3 Surge Events.

A surge or stall was reported in 31 engine ingestions. These events can be identified in appendix F by the words "surge" or "stall" in the "POWER LOSS" column. Half of the 26 surge events that had no physical core damage had no engine damage at all. Some fan blade damage occurred in the remaining 13. Four of the 5 surge events with core damage had blade/vane clash (events 32, 247, 263 and 328) and were nonrecoverable surges. These and the 3 other nonrecoverable surge events (152, 435, and 496) are discussed in the next section under "engine failure."

The amount of bird matter going into the core during a core ingestion is usually unknown even when the the quantity and weights of all birds ingested into the engine are known. It nevertheless proves informative to classify surge events according to bird weight class and bird multiplicity of the engine ingestion. The number of ingested birds was estimated in 30 of the surge events. Their frequency by bird weight class and bird multiplicity is plotted in figure 6.2. The figure includes 22 events for which bird weight was determined and 8 events in which it is unknown. Eleven events are in the 1-pound class, 8 of which were multiple-bird events, and 4 are in the 2.5-pound class. There is only one 0.5-pound class surge event although there were several multiple-bird ingestions in this weight class, many of which caused engine damage (section 5).

The tree diagram in figure 6.3 summarizes much of the data concerning core ingestions discussed in section 6.1.

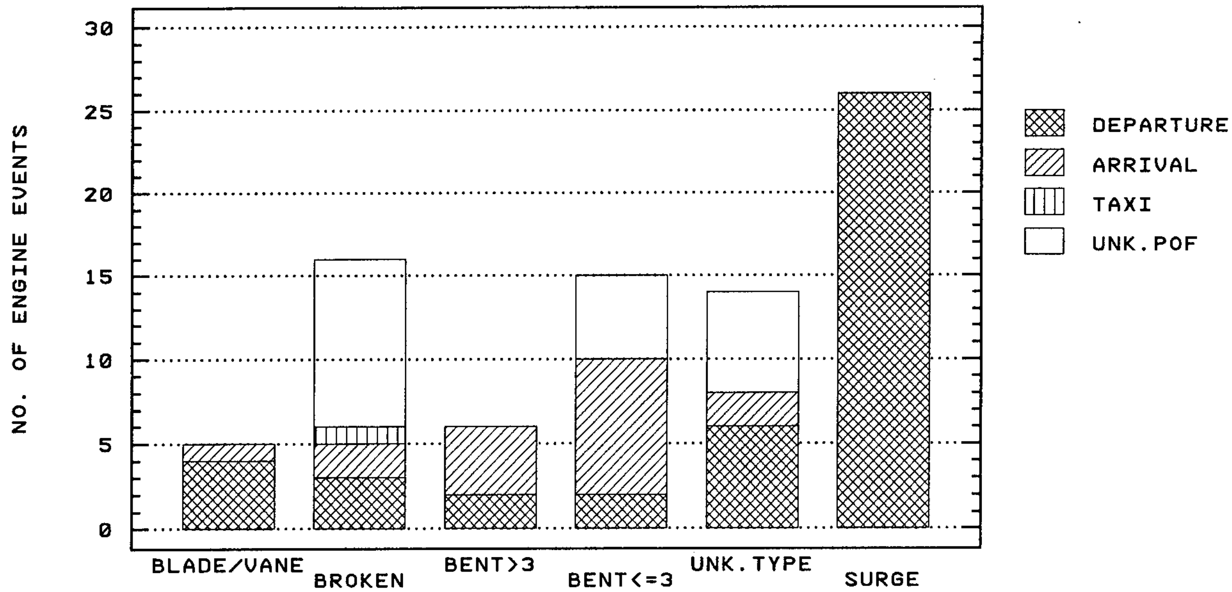


FIGURE 6.1. CORE DAMAGE BY PHASE OF FLIGHT

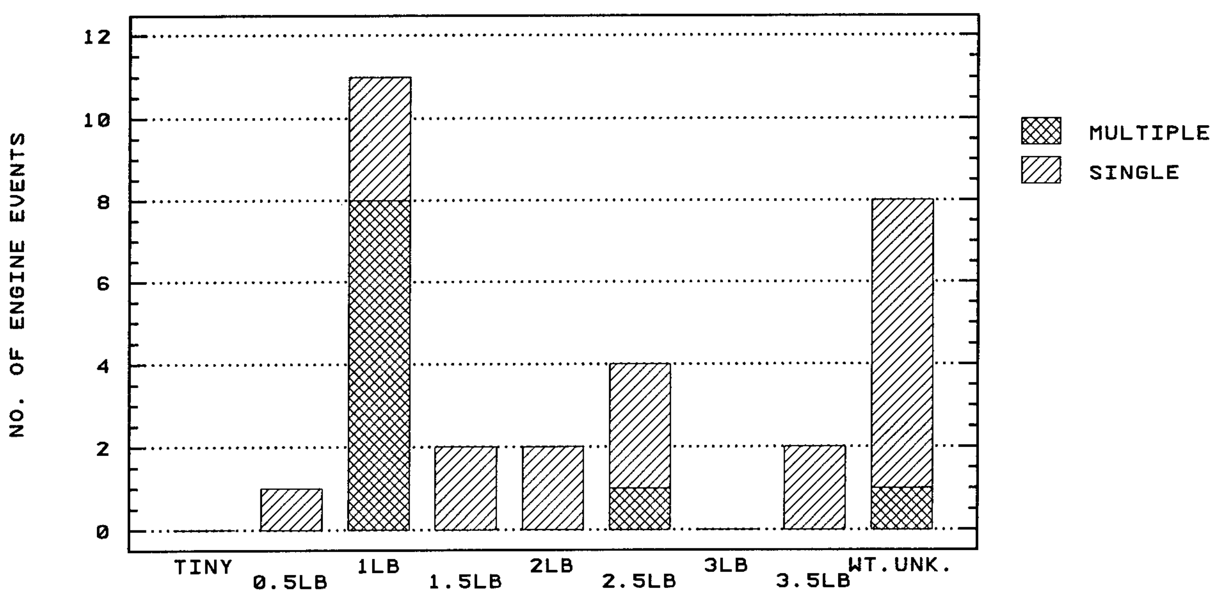


FIGURE 6.2. SURGE EVENTS BY BIRD WEIGHT CLASS AND SINGLE/MULTIPLE BIRD

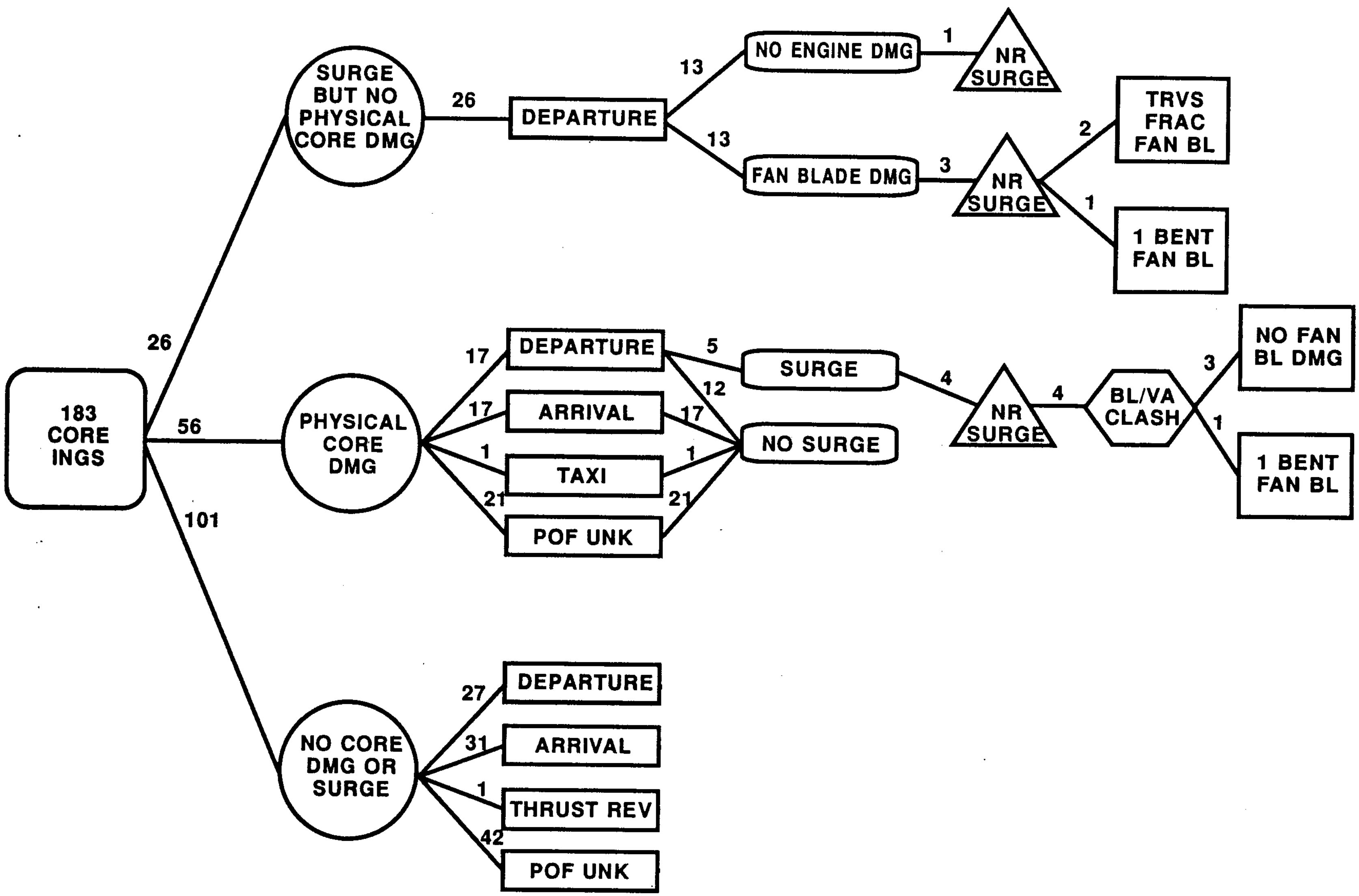


FIGURE 6.3. CORE INGESTION TREE DIAGRAM

6.2 FAN BLADE DAMAGE.

This section deals exclusively with fan blade damage. Categories of fan blade damage are defined to reflect the severity of bird-blade impact, without regard to the number of blades that were damaged. The goal is to clarify the relationship between fan blade damage, phase of flight, and the weights and numbers of ingested birds.

6.2.1 Fan Blade Damage Categories.

Ultimately it is the impact force of the bird on a particular fan blade that determines the type of damage, if any, that occurs to the blade. The impact could cause a transient "elastic" deformation or a permanent "plastic" bend to the leading edge. More severe impacts could cause pieces of the leading edge or tip to break off or, in the worst case, a blade could break chordwise (transverse fracture). The hierarcy of fan blade damage categories in table 6.2 was defined to reflect this progression. The categories are mutually exclusive and a given engine event is associated with the first applicable category and no other. A "no fan blade damage" category is also included. The 18 events in which shingling, but no other fan blade damage, occurred were put in this last category.

6.2.2 Fan Blade Damage by Bird Multiplicity.

A fan blade damage category was assigned in all but one engine event. Figure 6.4(a) (respectively 6.4(b)) gives the frequency (respectively relative frequency) of occurrence in each of the six categories for these 675 engine ingestions, of which 231 resulted in fan blade damage. The data are broken down according to bird multiplicity. This latter information was undetermined in 23 cases, including one "broken" and two "bent" blade events. Figure 6.4(b) seems to indicate that bird multiplicity is an influencing factor in "severity" of fan blade damage. The proportion of multiple- to single-bird events is greatest for transverse fractures and decreases monotonically across the 3 succeeding categories.

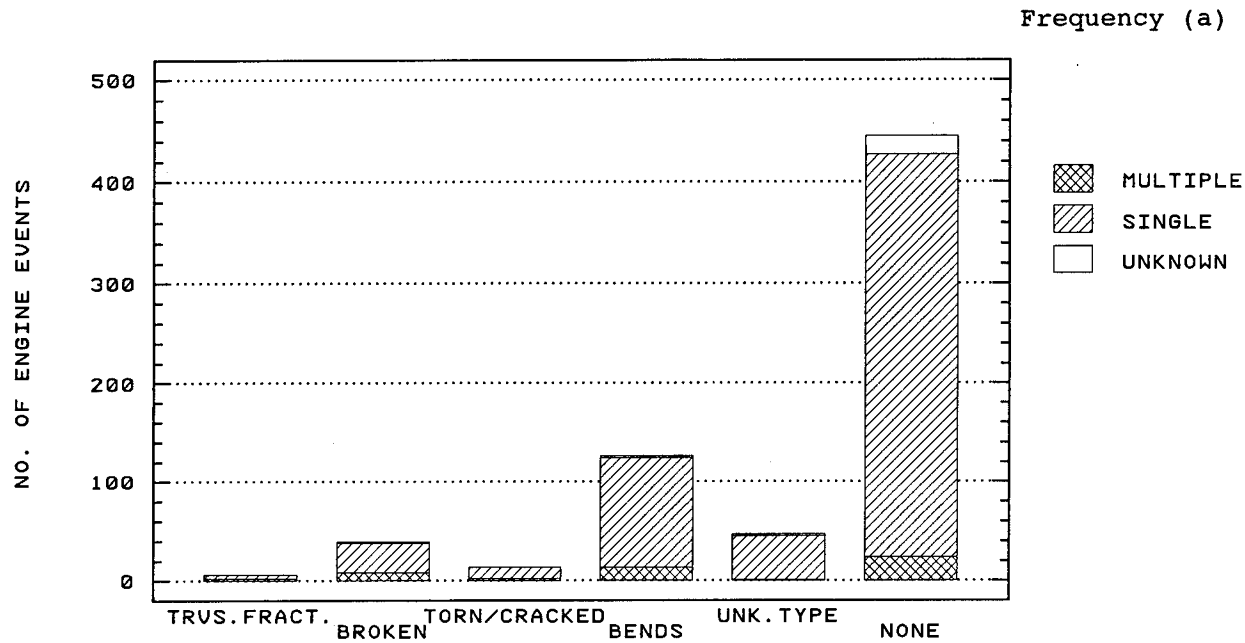
Twenty-six of 50 multiple-bird ingestions (52 percent) resulted in some fan blade damage. The corresponding numbers for single-bird events are 200 out of 618, or 32 percent. A *P*-value under 1 percent for the associated 2 x 2 contingency table is a strong indication that multiple-bird ingestions tend to cause fan blade damage more than single-bird ingestions. This result is not surprising in light of the laws of probability for repeated independent events (appendix B). For example, if the probability of a given single bird causing fan blade damage is, say, 32 percent, then, assuming independence, an ingestion of two birds would have a 54 percent probability of causing fan blade damage, and 3 birds a 69 percent probability. The relationship between bird multiplicity and engine damage in general is not as strong as in the above for fan blade damage alone. The corresponding *P*-value, as shown in section 5.2, was 8.4 percent.

6.2.3 Fan Blade Damage by Phase of Flight.

Figure 6.5(a) gives the frequency of ocurrence in each category of fan blade damage, according to phase of flight, for the 429 engine events in which this information is known. The corresponding relative frequencies are found in figure 6.5(b). The "other" phase of flight category includes the 1 cruise, 8 thrust

TABLE 6.2 FAN BLADE DAMAGE CATEGORIES - DEFINITIONS

CATEGORY	*DESCRIPTION*
TRANSVERSE FRACTURE	*FAN BLADE BROKEN CHORDWISE, PIECE LIBERATED*
BROKEN	*FAN BLADE LEADING EDGE OR TIP PIECES MISSING*
TORN/CRACKED	*TORN OR CRACKED FAN BLADE*
BENDS	*BENT, DENTED, OR DISTORTED FAN BLADE*
UNKNOWN	*SOME FAN BLADE DAMAGE BUT OF UNKNOWN TYPE*
NONE	*NO FAN BLADE DAMAGE (INCLUDES SHINGLING)*



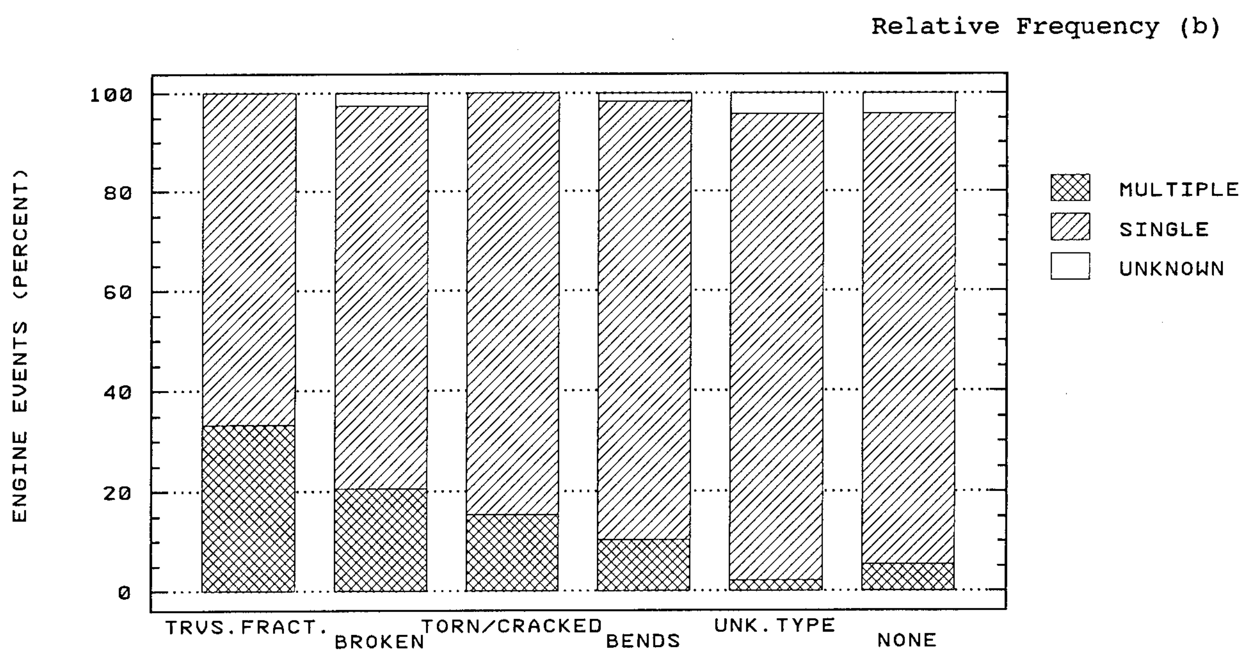
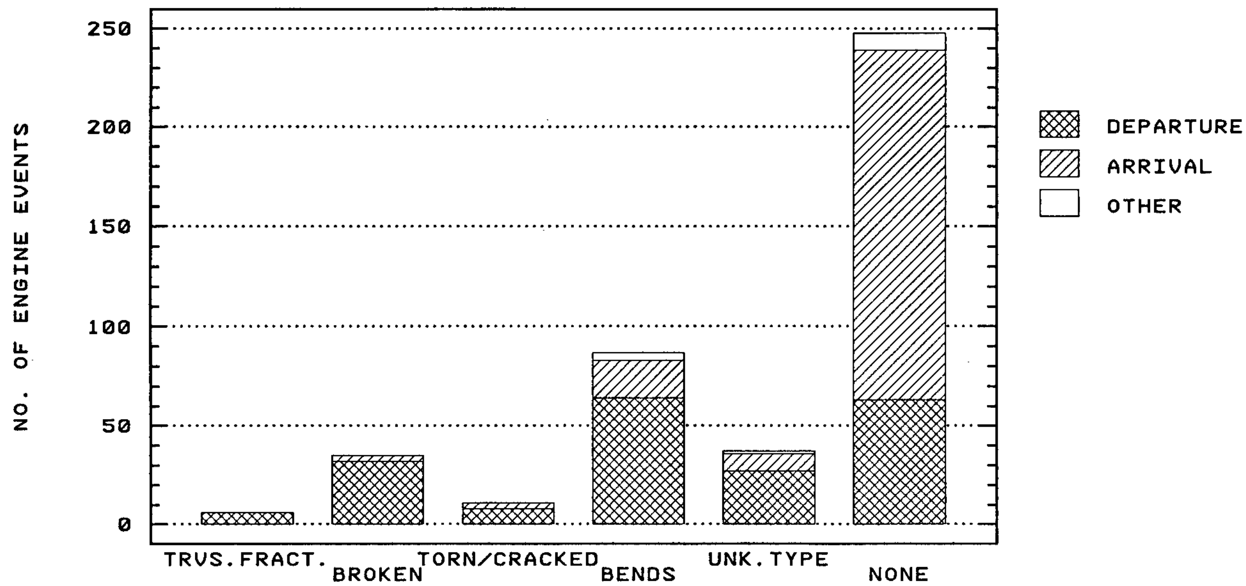


FIGURE 6.4. FAN BLADE DAMAGE BY SINGLE/MULTIPLE BIRD

Frequency (a)



Relative Frequency (b)

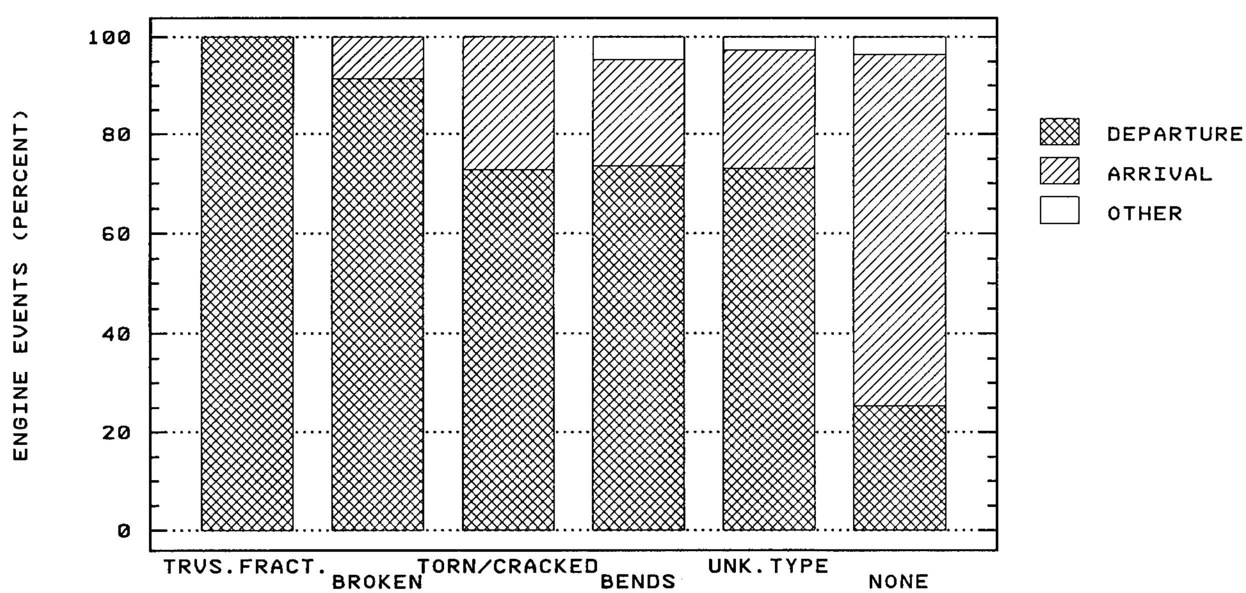


FIGURE 6.5. FAN BLADE DAMAGE BY PHASE OF FLIGHT

reverse, and 5 taxi events. All of the transverse fractures and 95 percent (all but 2) of the broken blade events occurred during departure, as did about 75 percent in each of the other 3 categories of fan blade damage. Only 25 percent of the nondamaging ingestions occurred during departures.

Some fan blade damage occurred in 136 of 199 departure engine events (68 percent) but in only 35 of 216 arrivals (16 percent). The *P*-value for the associated 2 x 2 contingency table is, in effect, zero which verifies statistically that fan blade damage tends to occur more during departures than arrivals.

6.2.4 Fan Blade Damage by Bird Weight.

A determination of bird weight and fan blade damage category was made in 203 engine events. Figure 6.6(a) plots the frequency in each category by bird weight class. The corresponding relative frequencies are shown in figure 6.6(b). Weights were obtained in 5 of the 6 transverse fracture events. Two are in the 1-pound class and one each in the 2.5-, 3-, and 3.5-pound classes. Most of the broken blade events fall in the 0.5-, 1-, and 2.5-pound classes. Phase of flight and bird multiplicity are not taken into account here.

6.2.5 Fan Blade Damage by Bird Weight and Phase of Flight.

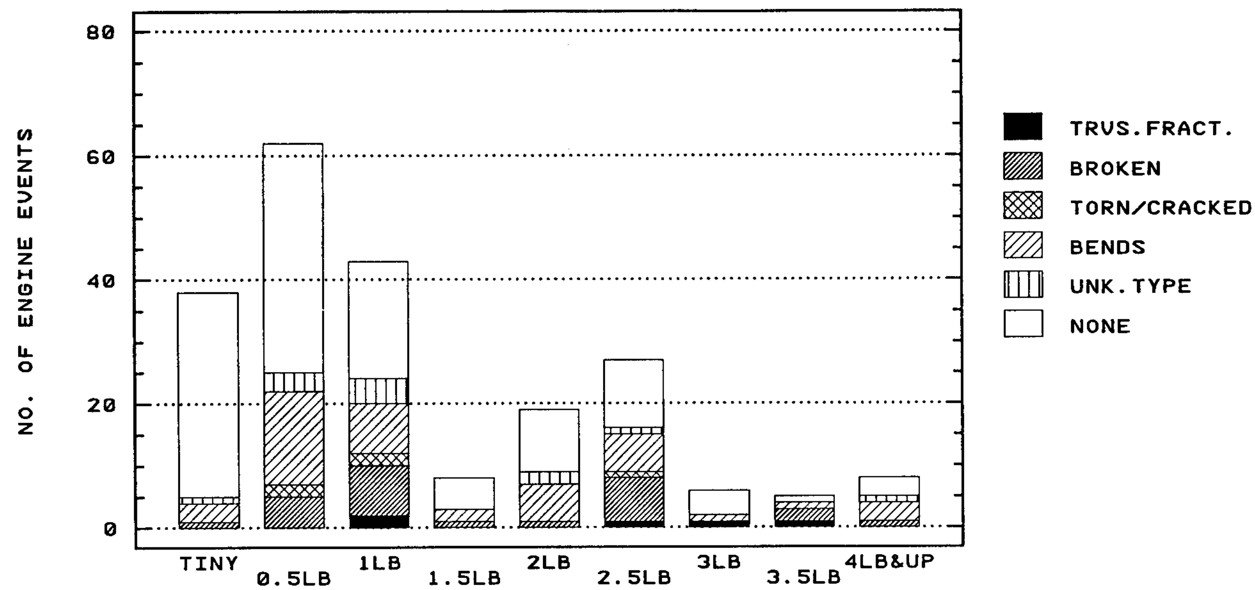
Bird weights were obtained in 85 engine events that occurred during a departure flight phase. Fan blade damage frequencies and relative frequencies for these events are contained in figures 6.7(a) and 6.7(b). With the exception of the 1.5-pound weight class, which had only 3 events, susceptability to some type of fan blade damage tends to increase with bird weight. This trend is not so strong, however, if only broken or transverse fractured fan blades are considered. Only 1 of 4 departure ingestions in the 4-pound & up class resulted in a broken fan blade and the 2-pound class had none.

The corresponding histograms for the 69 arrival events in which bird weights were obtained are in figures 6.8(a) and 6.8(b). The single broken blade arrival event falls in the 2-pound class. The majority of fan blade damage is in the bent blade category. The number of events in each weight class is small and any relationship between the probability of fan blade damage and bird weight is not as evident for arrivals as was for departures.

6.2.6 Fan Blade Damage by Bird Weight, Phase of Flight, and Bird Multiplicity.

A logistic regression model was fit, using "S-Plus", for the occurrence of any fan blade damage as a function of the predictor variables bird weight, flight phase (departure/arrival) and bird multiplicity (single/multiple). Stepwise selection resulted in all three predictors being statistically significant at 5 percent (appendix B.) Mean curves for the probability of any fan blade damage as a function of bird weight are given in figure 6.9 for the four flight phase/bird multiplicity combinations. The probability of fan damage is nearly 80 percent for even the smallest birds in multiple-bird encounters during departure and about 90 percent for 2.5-pound birds. In single-bird departure events, the probability of fan blade damage is over 50 percent for tiny birds and rises to 80 percent at about 2.5-pounds. As expected, the corresponding probabilities are much lower during arrival. The confidence curves given in figure 6.10 for each of the four cases indicate that the correlation of fan damage with bird weight is stronger for departures than arrivals. The above

Frequency (a)



Relative Frequency (b)

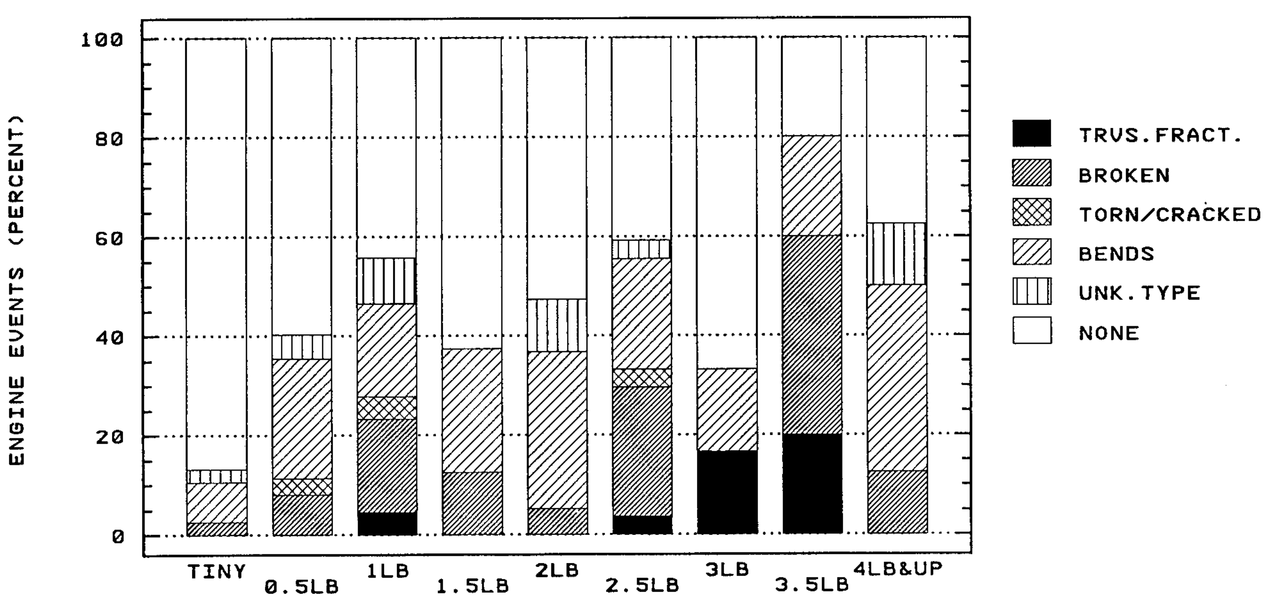
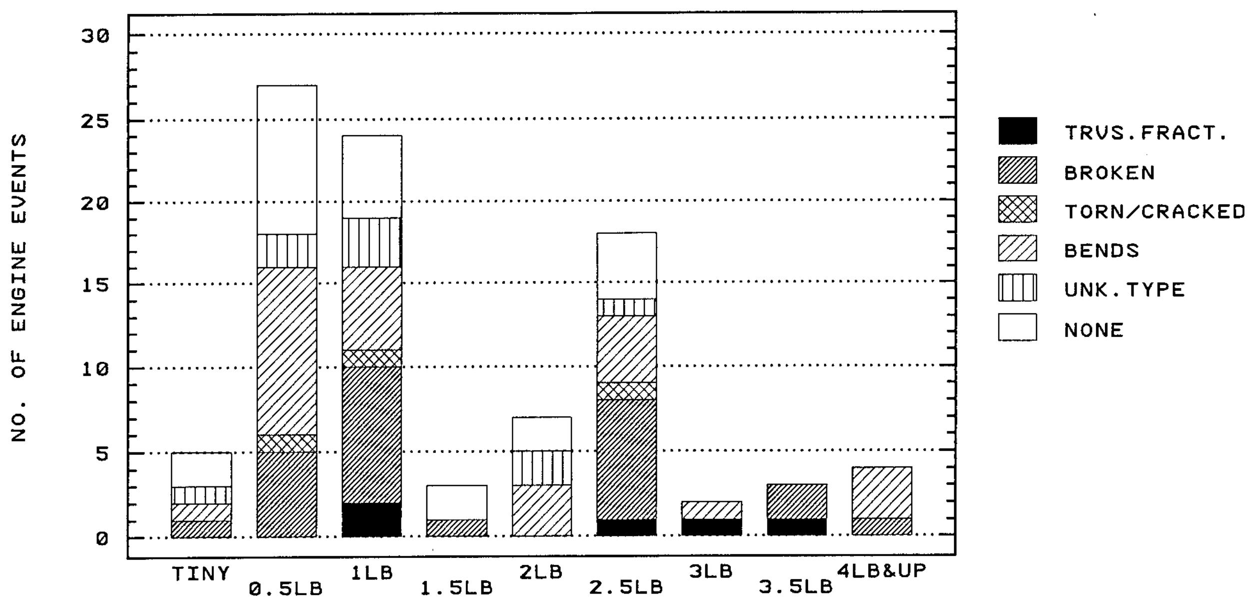


FIGURE 6.6. FAN BLADE DAMAGE BY BIRD WEIGHT CLASS

Frequency (a)



Relative Frequency (b)

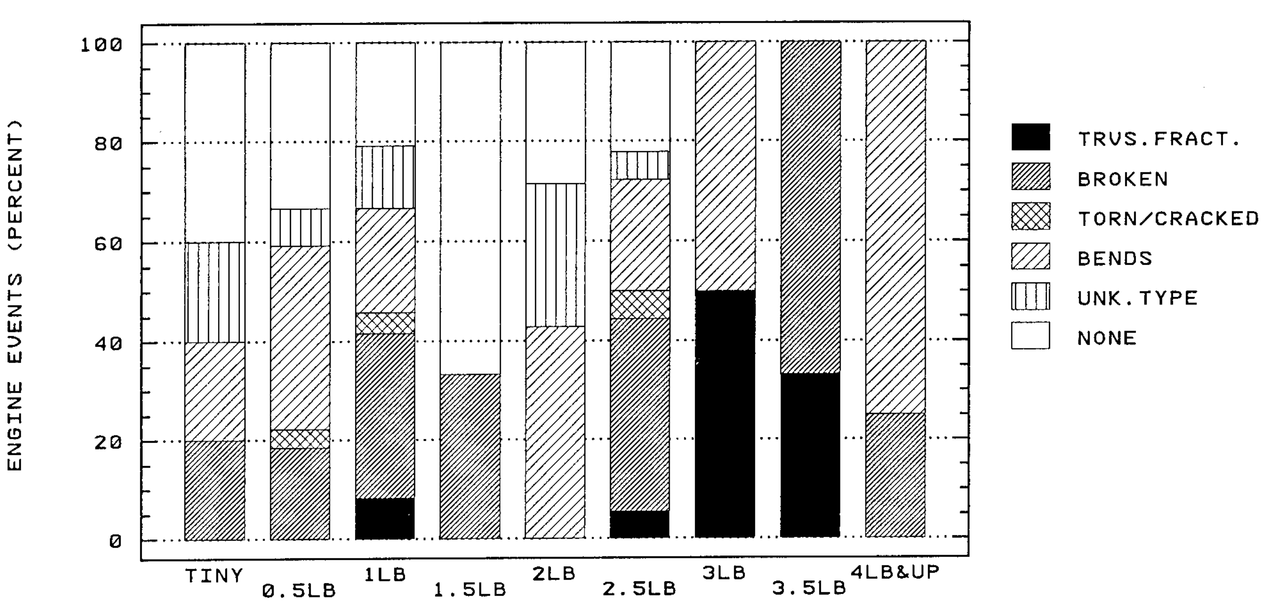
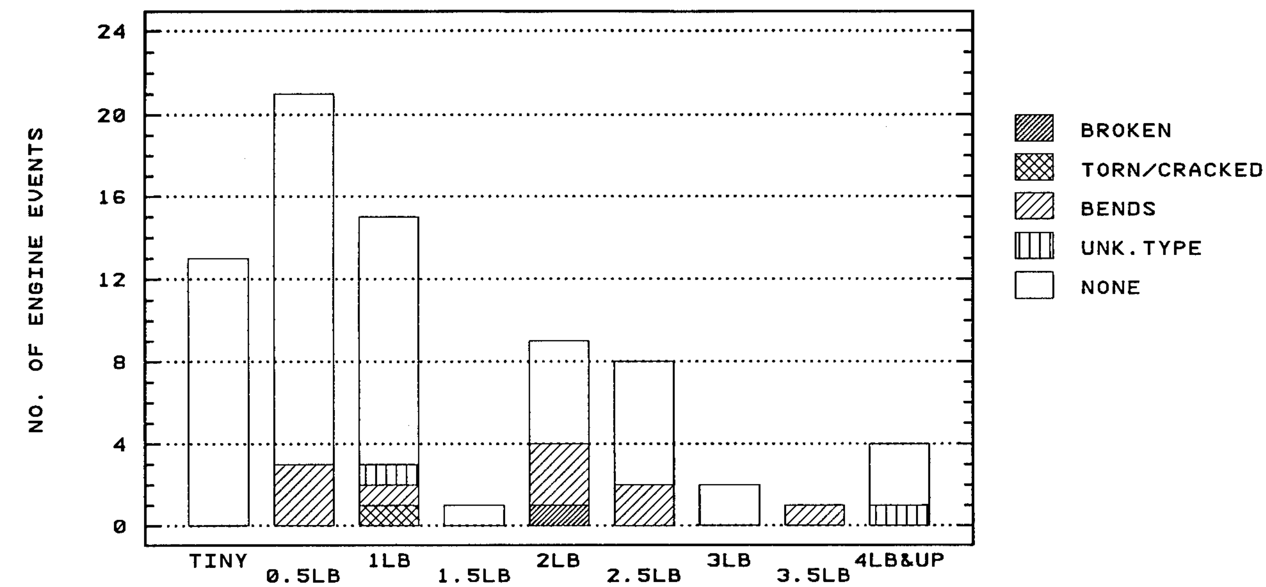


FIGURE 6.7. FAN BLADE DAMAGE BY BIRD WEIGHT CLASS - DEPARTURES

Frequency (a)



Relative Frequency (b)

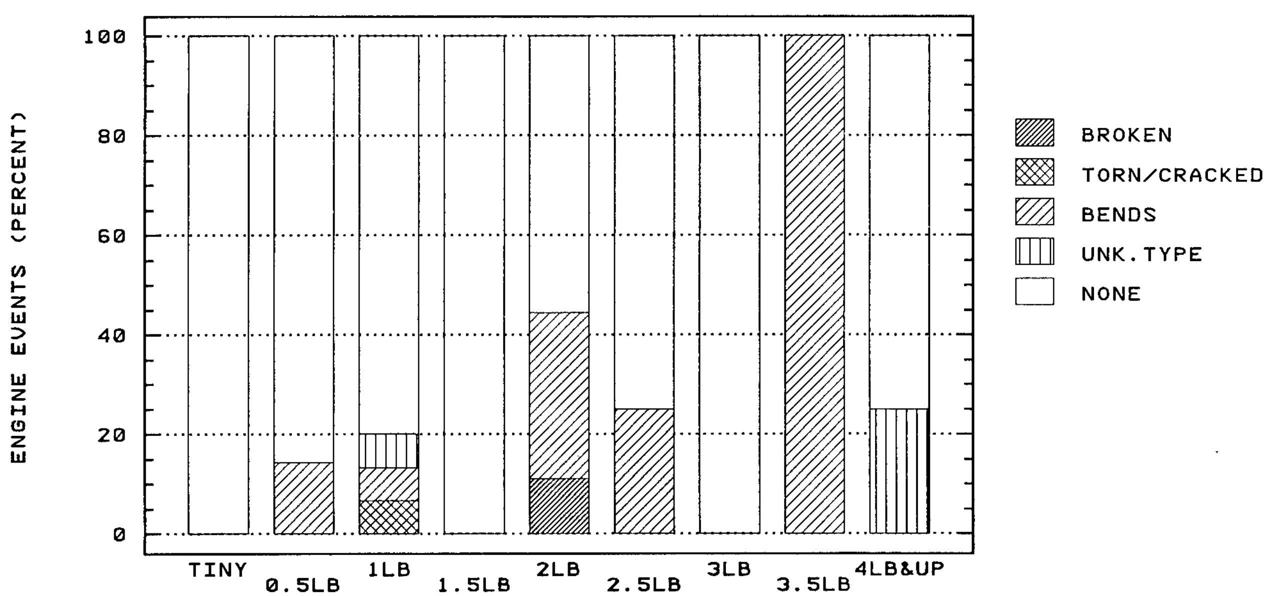


FIGURE 6.8. FAN BLADE DAMAGE BY BIRD WEIGHT CLASS - ARRIVALS

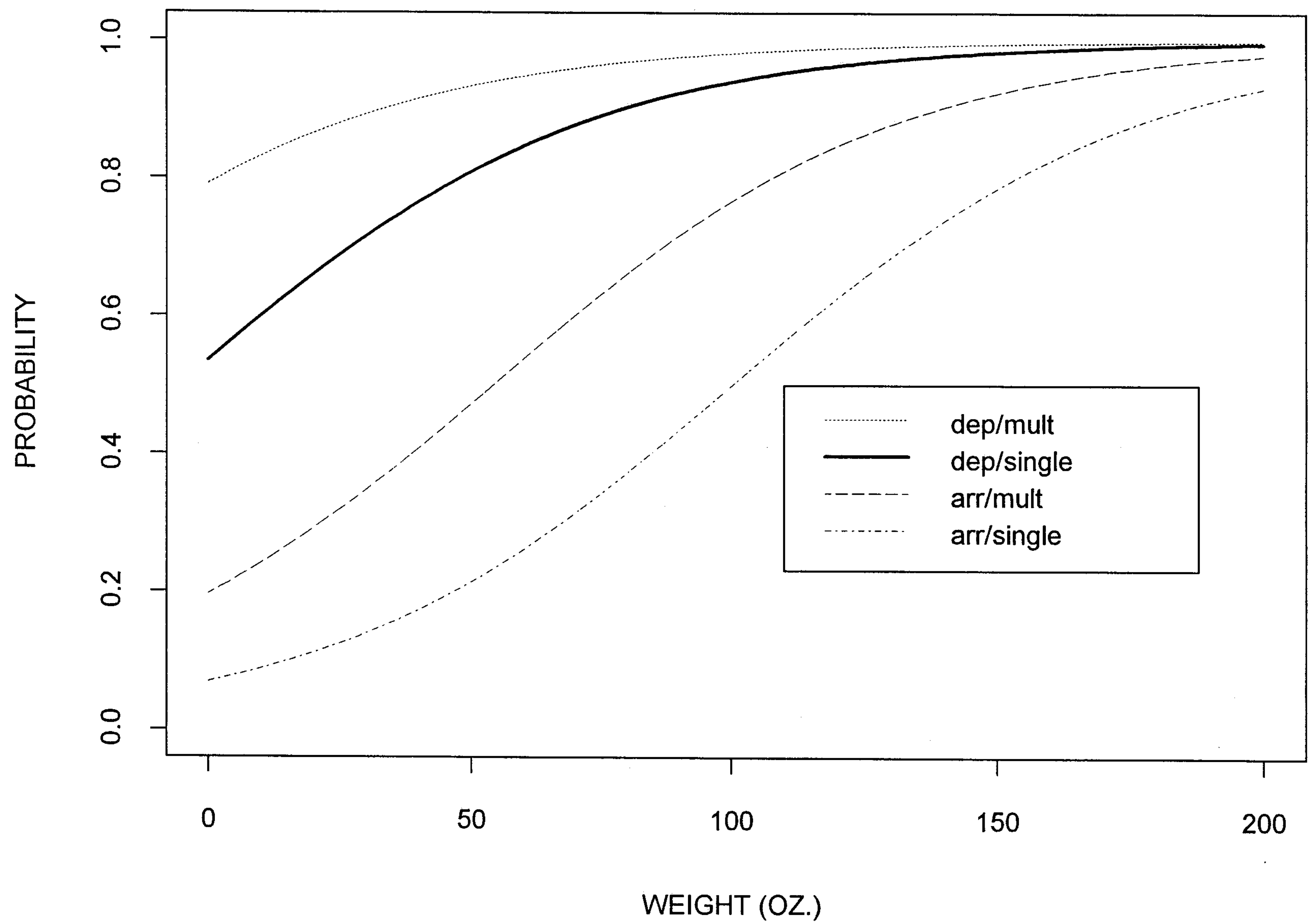


FIGURE 6.9. PROBABILITY OF FAN BLADE DAMAGE - LOGISTIC REGRESSION MODEL MEAN CURVES

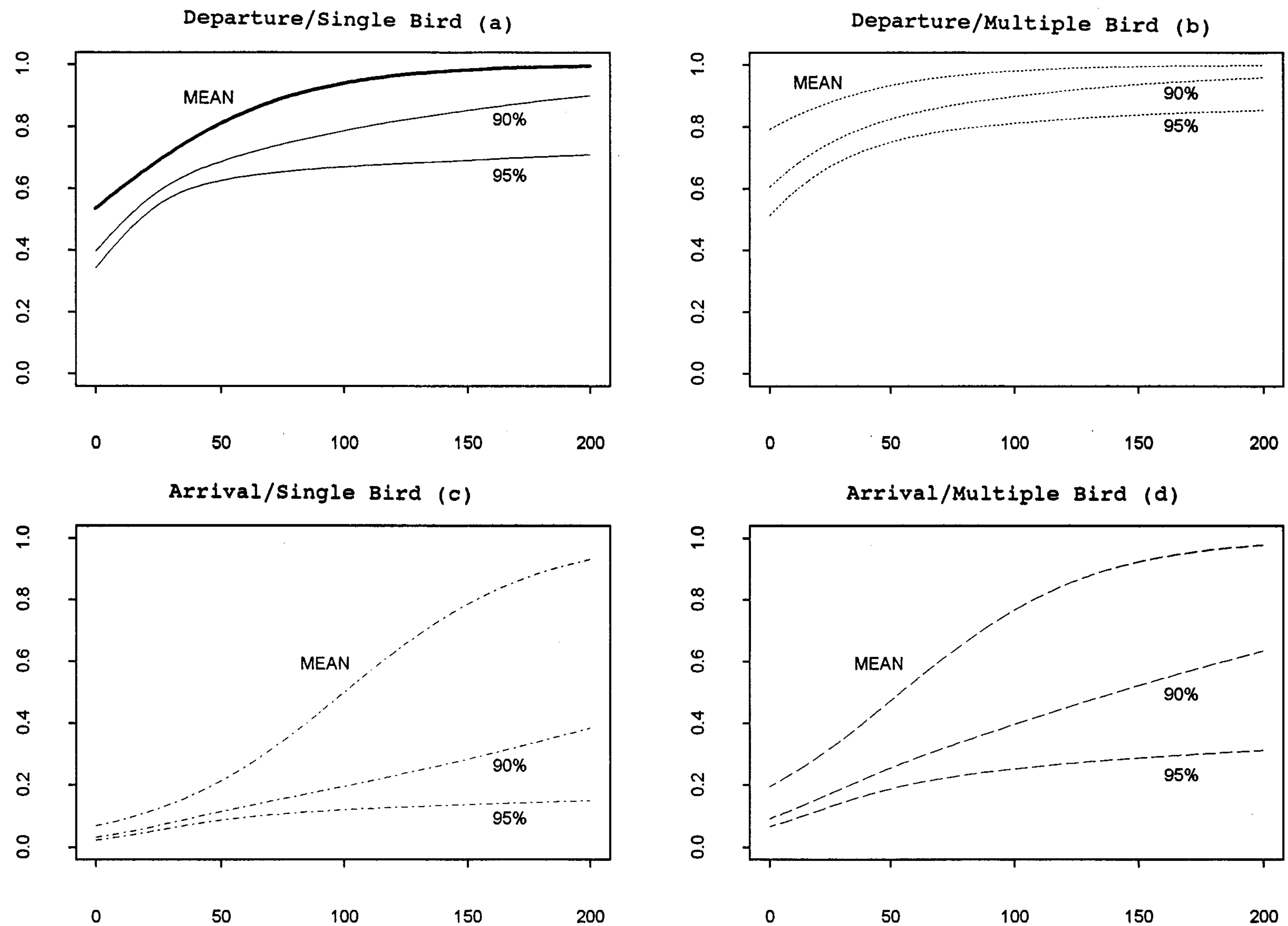


FIGURE 6.10. PROBABILITY OF FAN BLADE DAMAGE - LOGISTIC REGRESSION MODEL LOWER CONFIDENCE CURVES

model was derived from the 152 engine events for which data were complete in all pertinent factors.

A more severe type of fan blade damage, defined by the incidence of any transverse fractured, broken, cracked, or torn fan blade, was also modeled as a function of the three predictor variables. Stepwise selection showed phase of flight to be a statistically significant predictor but bird weight and bird multiplicity were not. Twenty-three percent of departure ingestions resulted in fan blade damage of the above type while only 3 percent of arrivals did likewise.

6.2.7 Fan Blade Damage by Shrouded/Unshrouded Blades.

Wide-chord unshrouded fan blades have been coming into greater use in newer engines. Of the engines in this study, only the V2500-A1 and RB211-535E4,-524G,-524H have no shrouds. All except the recently introduced 524H experienced bird ingestions. In a total of 41 shroudless engine events there were no reported incidents of torn, cracked, broken, or transversely fractured fan blades. Only 10 shroudless engines sustained any fan blade damage, all of the "bent blade" category. Of these, 7 resulted from the 10 ingestions into shroudless engines that are known to have taken place during some departure phase of flight.

7. EFFECTS ON FLIGHT

The underlying reason for concern about ingestion of birds into engines is the potential for disruption of aircraft flight by this phenomenon. Aside from economic considerations the adverse effects of bird ingestion can have severe safety repercussions. A B737 crashed on takeoff in Ethiopia in 1988 after both engines failed upon ingesting multiple birds [2]. During this study a B747 narrowly averted disaster after encountering a flock of pigeons during takeoff in Los Angeles (event 138). There are numerous instances of power loss, in-flight engine shutdowns, and adverse crew actions in the data. These and other deleterious effects are summarized in this section, and an attempt is made to provide some insight into their relationship with the numbers and weights of ingested birds.

7.1 POWER LOSS AND ENGINE FAILURE

Bird ingestion can cause an involuntary loss of power or thrust in the affected engine. Provision was made in the FAA data base for reporting the engine's instrumented power immediately before and after the ingestion so that a precise measure of power loss could be obtained. This information was supplied, however, for only 15 engine ingestions. Some loss of engine power following an ingestion was reported 38 times. This figure includes all "surge" events discussed in the previous section. A quantitative estimate of the extent of power loss, when made, was usually the result of an engineering judgment based on pilot interviews, in-flight data recordings, assessment of engine damage, and engine symptoms and pilot reaction following the incident.

FAA regulations specify a 75 percent post-ingestion sustained engine power requirement in the medium bird certification test [appendix A]. Previous FAA studies have used "the inability to maintain approximately 50 percent usable thrust" as a criterion for engine failure. (There were 32 engine failures in the 1981-83 FAA large engine study [1].) Momentary, recoverable engine surges, discussed in section 6, are therefore excluded, as are a few events (513, 579, 587, 590) in which a small fraction (5 to 10 percent) of engine power is believed to have been lost. There are no other known incidents with a power loss below 50 percent.

There were, however, 12 ingestion events which clearly satisfy the above engine failure criterion. Half of these involved the transverse fracture of a fan blade and the remaining were nonrecoverable surges (Section 6). These events are summarized in table 7.1. For each factor, a "Y" denotes occurrence and a "blank" nonoccurrence. Acronyms used for phases of flight are defined in appendix F. All 12 engine failures occurred in a single engine of the aircraft during a departure phase of flight, although events 138 and 152 were multiple-engine events. Takeoffs were aborted in 5 events and the remaining engine failures caused air turnbacks. As noted in section 6, the engine in event 496 had no physical damage. Bird weights were obtained in all but one of the engine failure events. Their frequency distribution by bird weight class is given in figure 7.1. The number of ingested birds is also indicated in the figure. There were 3 multiple-bird events in the 1-pound class, and 4 events in the 2.5-pound class. One 2.5-pound ingestion was also a multiple-bird event.

TABLE 7.1 ENGINE FAILURES

evt	date	acft	eng	pof	eng pos	crew actn	inc vibe	surge	hi egt	trvs frac	bl/ vane	bird wt	mult bird	phys dmg	unc nacl
32	05/10/89	A300	JT9D	TR	1	ATB		Y	Y		Y	36	Y	Y	
75	08/14/89	B767	CF6	CL	1	ATB	Y			Y		48		Y	
138	09/12/89	B747	JT9D	TR	2	ATB	Y	Y	Y	Y		14	Y	Y	Y
152	10/12/89	B747	JT9D	TR	2	ATB		Y				18	Y	Y	
103	10/23/89	A310	CF6	TR	1	ATO	Y	Y		Y		16	Y	Y	Y
247	05/31/90	A300	JT9D	TR	1	ATB	Y	Y	Y		Y	40		Y	
257	07/30/90	B757	2000	CL	2	ATB	Y			Y		40.4		Y	
263	08/05/90	B747	JT9D	TR	4	ATO		Y			Y	40		Y	
328	09/03/90	B747	JT9D	TR	4	ATB		Y	Y		Y	28		Y	
435	10/14/90	B747	JT9D	TR	4	ATO		Y	Y	Y				Y	
470	02/04/91	A300	CF6	TR	2	ATO				Y		52		Y	Y
496	03/13/91	B767	JT9D	TR	1	ATO		Y	Y			22			

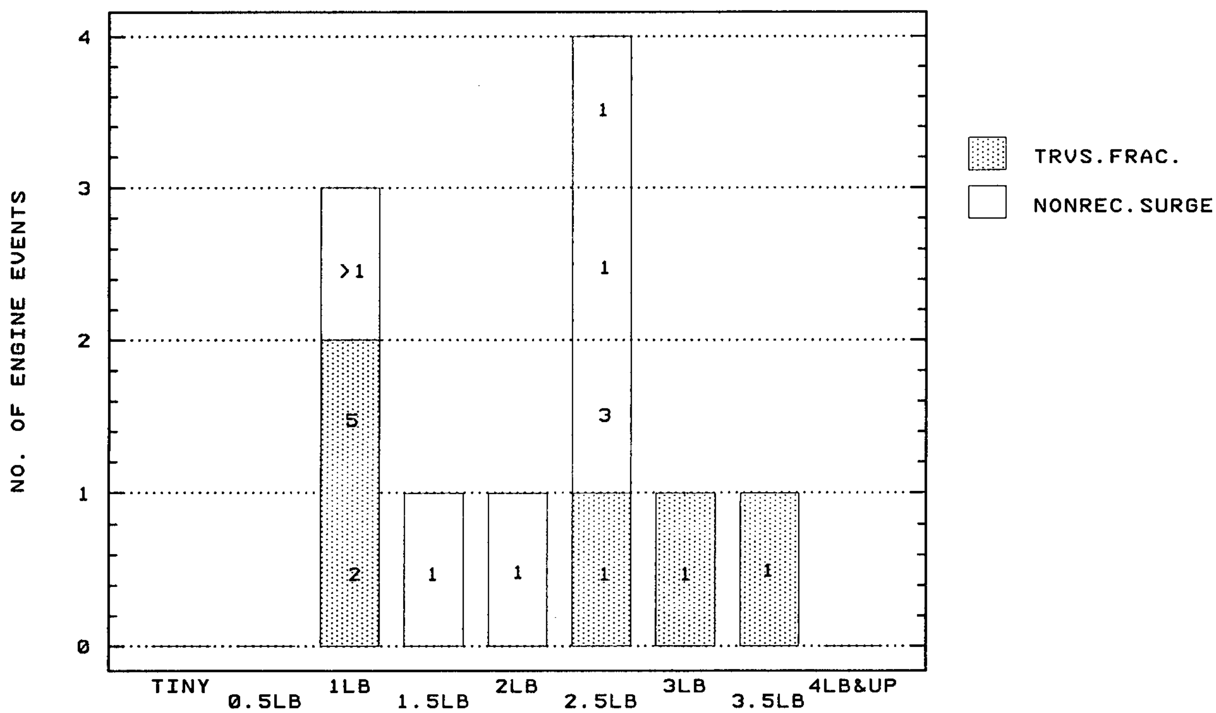


FIGURE 7.1. ENGINE FAILURES BY BIRD WEIGHT CLASS AND BIRD NUMBERS

7.2 CREW ACTION EVENTS.

All told there were 28 aborted takeoffs (ATO's) among the aircraft events. Six of these involved multiple engines or multiple birds. Besides the ATO's there were 61 other occasions of an adverse "crew action," i.e., a change in the planned flight path of the aircraft. These include 53 air turnbacks (ATB's), 7 diversions to a landing at an unscheduled airport (DIV's), and 1 change of altitude (ALT) on a subsequent flight. Nine of the 89 crew action events involved multiple engines and 14 involved multiple birds, including 5 aircraft ingestions that were both multiple-engine and multiple-bird events.

Figure 7.2 is a tree diagram which breaks down each of the above classes of crew action events according to category of engine damage. The "damage category of an aircraft event" is defined to be the most severe category of damage sustained by any engine on the aircraft; none, minor, or significant as in section 5. Fifty of the 53 ATB events were damaging, 33 significantly. These totals include one event (317) in which an engine sustained extensive turbine damage and, upon inspection, was discovered to have ingested a single 1-ounce bird on some prior flight. The engine damage, which was caused by a casting defect, was unrelated to the bird ingestion. (This event was considered nondamaging in all engine damage versus bird weight analyses.) Five of 7 DIV events involved significant damage as did 15 of 29 ATO's. Nine of the 13 nondamaging crew action events were ATO's. A recoverable engine surge was noted in seven of these. In event 152, both engines surged but only one engine recovered. The six other recoverable surge ATO's (events 22, 34, 169, 215, 437, and 497) were all single-engine and nondamaging. Event 22 resulted in an engine in-flight shutdown (IFSD).

All told there were 15 IFSD's among the 89 crew action events. (By convention, an "IFSD" can occur while the aircraft is on the runway.) The IFSD's are indicated in the next level of the tree in figure 7.2. Eleven of these, ten of which involved significant engine damage, are in the ATB's. All IFSD events are discussed in section 7.3.

Verified bird weights were obtained in 49 of the 89 crew action events. Figure 7.3 indicates the bird weight class involved in each of these events, and for the "no crew action" and "unknown crew action" events as well. The 0.5-pound and 2.5-pound classes each had the greatest number of crew action events, twelve, followed by eleven for the 1-pound class. The relative frequency of crew action events in the 2.5-pound class is 57 percent, a much higher figure than in the two smaller weight classes. The aforementioned event (317) in which an ATB was unrelated to the bird ingestion, accounts for the single "tiny" bird event in figure 7.3.

7.3 IN-FLIGHT SHUTDOWN EVENTS.

As previously noted, 15 of the "crew action" events resulted in an IFSD. The only other IFSD occurred in event 76 in which the A310 sustained minor fan blade damage in one engine during climb out. The engine was shut down because of vibration but the flight continued to its destination. All 16 IFSD events are summarized in table 7.2. Multiple birds were ingested into four of the engines that were shut down in flight. There were no multiple-engine IFSD's although in event 138, two engines of the B747 ingested birds. Increased engine vibration was cited ten times and a surge six times as contributing factor to an IFSD. Other symptoms given were high exhaust gas temperature (five times), and a bird

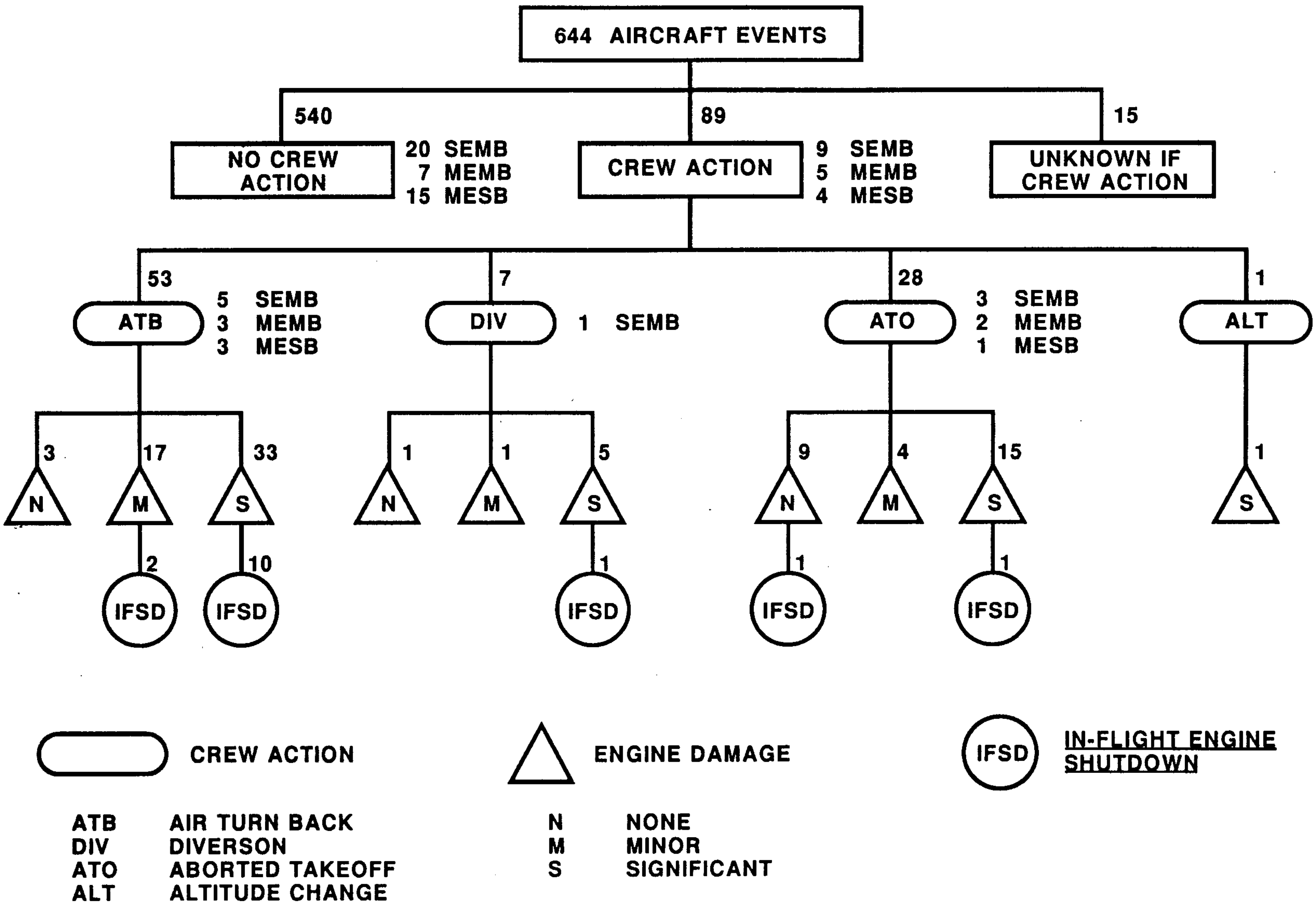


FIGURE 7.2. CREW ACTION TREE DIAGRAM

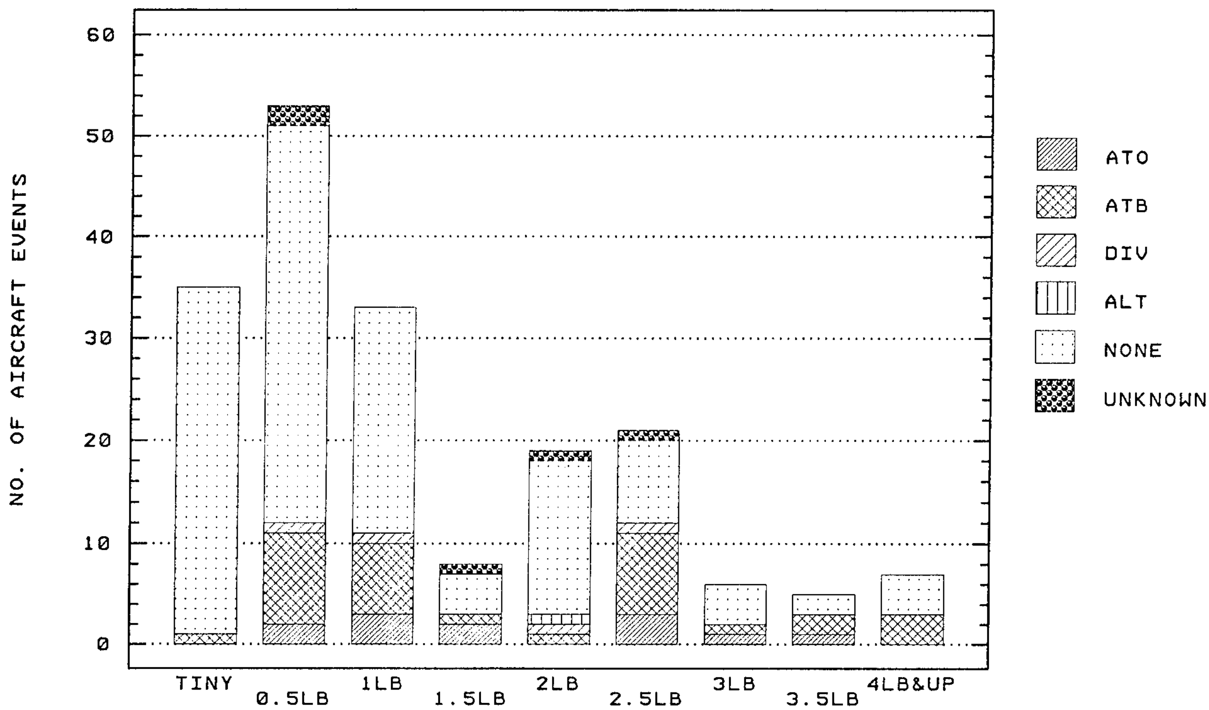


FIGURE 7.3. CREW ACTION EVENTS BY BIRD WEIGHT CLASS

TABLE 7.2 IN-FLIGHT SHUTDOWN EVENTS

evt	date	acft	eng	pof	eng pos	crew actn	eng fail	surge	smell	inc vibe	hi egt	trvs frac	bird wt	mult bird	eng dmg
22	04/12/89	B747	JT9D	TR	1	ATO		Y							N
32	05/10/89	A300	JT9D	TR	1	ATB	Y	Y			Y		36	Y	S
140	07/25/89	A320	V2500	TR	1	ATB			Y					Y	M
75	08/14/89	B767	CF6	CL	1	ATB	Y			Y			48		S
76	08/18/89	A310	CF6	CL	1					Y					M
138	09/12/89	B747	JT9D	TR	2	ATB	Y	Y		Y	Y	Y	14	Y	S
267	05/04/90	A320	CFM56	TR	1	ATB				Y					M
247	05/31/90	A300	JT9D	TR	1	ATB	Y	Y		Y	Y		40		S
241	06/27/90	B747	JT9D	TR	3	DIV				Y			40		S
257	07/30/90	B757	2000	CL	2	ATB	Y			Y			40.4		S
317	08/10/90	A300	4000	TC	1	ATB							1		N
328	09/03/90	B747	JT9D	TR	4	ATB	Y	Y			Y		28		S
435	10/14/90	B747	JT9D	TR	4	ATO	Y	Y			Y				S
513	05/27/90	A320	CFM56	TR	1	ATB				Y					S
579	08/07/91	B767	CF6	CL	2	ATB				Y			40		S
590	07/09/91	B767	CF6	TO	1	ATB				Y				Y	S

smell (once). As previously noted, 7 of the IFSD events were engine failures. Verified bird identifications were obtained in 9 events. Four of these involved birds in the 2.5-pound weight class of which three (events 32, 247, and 241) were Herring Gulls. Three Herring Gulls were ingested into a single engine in event 32.

7.4 UNCONTAINED EVENTS.

Fragments from broken fan blades can cause secondary damage to an engine following a bird ingestion. These fragments sometimes exit through the engine's case or nacelle (an "uncontained" event) and have the potential for seriously damaging the aircraft. There were no incidents of engine case uncontainment; although in two events (74 and 103), blade fragments punctured the metallic engine casing but were contained by the Kevlar containment system. In the latter event, fragments did exit through the nacelle. Event 103 and the six additional instances of uncontained nacelle damage are summarized in table 7.3. Fortunately, there were no reports of further damage to the aircraft in any of the uncontained events; although in event 241, a piece of blade from one engine ricocheted off the runway and struck the adjacent engine of the B747. Both affected engines in event 138 received uncontained damage to the nacelle. Bird identifications were obtained in five of the uncontained events. Herring Gulls weighing 2.5 pounds were cited twice (and also in the aforementioned event 74). The other three events all resulted from ingestions of multiple birds in the 1-pound weight class. Both uncontained events lacking a bird identification involved single birds.

7.5 MULTIPLE-ENGINE EVENTS.

All transport category aircraft are certificated to perform safely, during all flight phases, with any single engine inoperable. (See CFR Title 14, Part 25.) Multiple-engine ingestion events are of particular interest because an in-flight loss of two engines during the critical takeoff or climb phases could be catastrophic, even in three- or four-engine aircraft. Table 7.4 summarizes the 31 multiple-engine events in the data, all but one of which involved two engines. Three engines of the B747 in event 482 ingested birds. In event 138, one engine lost power due to a fan blade transverse fracture and was shut down. The cockpit symptoms following ingestion were a surge and high exhaust gas temperature. The other affected engine also surged and, fortunately, recovered. Both engines also surged, and one failed to recover, in event 152. Both engines of the B757 were damaged significantly in event 442. Six other events, 102, 201, 323, 427, 400, and 448 resulted in multiple-engine damage. Significant damage in a single engine occurred in three of these events. The B767 in event 201 received minor damage to each engine and performed an air turnback. It is interesting to note that the affected engines were on the same wing in all five of the 2-engine B747 multiple-engine events. The single 3-engine event (482) occurred during landing and was nondamaging. Verified bird weights were obtained in 16 of the multiple-engine events and are listed in table 7.4. Event 333 yielded a different species and weight for each engine. These 17 unique multiple-engine event weights were included in figure 4.7 of section 4.

TABLE 7.3. UNCONTAINED EVENTS

evt	date	unc case	unc nacl	acft	eng	pof	eng pos	ifsd	eng fail	surge	inc vibe	hi egt	trvs frac	bird wt	mult bird
217	07/05/89		Y	A300	JT9D	LD	1								
138	09/12/89		Y	B747	JT9D	TR	1			Y				14	Y
138	09/12/89		Y	B747	JT9D	TR	2	Y	Y	Y	Y	Y	Y	14	Y
103	10/23/89		Y	A310	CF6	TR	1		Y	Y	Y		Y	16	Y
231	03/16/90		Y	A300	JT9D	CL	2				Y			40	
241	06/27/90		Y	B747	JT9D	TR	3	Y			Y			40	
435	10/14/90		Y	B747	JT9D	TR	4	Y	Y	Y		Y	Y		

TABLE 7.4 MULTIPLE-ENGINE EVENTS

evt	date	acft	eng	pof	crew actn	eng pos	eng dmg	eng fail	surge	ifsd	inc vibe	hi egt	trvs frac	bird wt	mult bird
1	01/24/89	B757	RB211	TR	ATB	1	N							8	
						2	M				Y			8	
24	04/18/89	B767	JT9D			1	N							0.5	
						2	N							0.5	
171	08/31/89	B747	4000	LR		3	N								Y
						4	N								Y
138	09/12/89	B747	JT9D	TR	ATB	1	S		Y					14	Y
						2	S	Y	Y	Y	Y	Y	Y	14	Y
112	10/07/89	B757	RB211	LD		1	N								
						2	N								
152	10/12/89	B767	JT9D	TR	ATO	1	N		Y					18	Y
						2	S	Y	Y					18	Y
102	10/21/89	B747	CF6	CL		3	S								
						4	M								
85	11/21/89	A320	CFM56	LR		1	N							14	
						2	N							14	
97	12/14/89	A310	CF6	LR		1	M							10	Y
						2	N							10	Y
193	01/16/90	A310	CF6			1	N								
						2	N								
244	02/09/90	A310	JT9D			1	N								
						2	N								
201	02/21/90	B767	CF6	TR	ATB	1	M							7.7	
						2	M				Y			7.7	
225	02/21/90	B767	JT9D	AP		1	S							40	Y
						2	N							40	
214	06/17/90	B757	RB211	LD		1	N							32	Y
						2	N							32	Y
323	08/14/90	B757	2000	TO		1	S							40	Y
						2	M							40	
632	08/17/90	B767	CF6	LR		1	N							1	
						2	N							1	

TABLE 7.4 MULTIPLE-ENGINE EVENTS (CONTINUED)

evt	date	acft	eng	pof	crew actn	eng pos	eng dmg	eng fail	surge	ifsd	inc vibe	hi egt	trvs frac	bird wt	mult bird
382	09/04/90	B747	CF6	LR		1	N							10	Y
						2	N							10	Y
333	09/17/90	B747	JT9D	TX		3	N							0.5	
						4	N							56	Y
442	11/14/90	B757	2000	TR	ATO	1	S		Y					14	Y
						2	S		Y					14	Y
427	11/24/90	B757	RB211	TR	ATB	1	M				Y			16	Y
						2	M							16	Y
400	12/03/90	A320	CFM56	TR	ATB	1	M								
						2	M								
448	12/23/90	B757	2000	CL	ATB	1	S		Y					17	Y
						2	M		Y					17	
463	01/29/91	A310	CF6			1	N								
						2	N								
482	03/19/91	B747	CF6	LR		1	N								
						2	N								
						3	N								
550	06/03/91	B767	CF6			1	N								
						2	N								
536	06/23/91	A310	CF6	LR		1	N								
						2	N								
559	07/21/91	A320	CFM56	LR		1	N								
						2	N								
563	07/21/91	A320	CFM56	LD		1	M							10	
						2	N							10	
565	07/29/91	A320	CFM56	AP		1	M							60	
						2	M							60	
567	08/04/91	A320	CFM56	AP		1	N								
						2	N								
573	08/11/91	B767	CF6	TR	ATO	1	N								
						2	N								

8. SUMMARY AND CONCLUSIONS.

The data in this report were generated from over 3 million operations flown by a fleet of more than 1500 aircraft during the period January 1989 to August 1991. Aircraft models include the A300, A310, A320, B747, B757, B767, DC10, and MD11.

A total of 644 aircraft ingestions was reported by the engine manufacturers, yielding a worldwide ingestion rate of 2.04 ingestions per 10,000 aircraft operations. This is approximately 87 percent of the rate in the 1981-83 FAA study. The foreign aircraft ingestion rate is three and one-half times the United States rate, compared with two and one-half times in the previous study. However, an analysis of engine damage indicates that domestic ingestions were under reported with respect to foreign.

Aircraft ingestion events were reported to have occurred at 162 different airports worldwide. Schipol Airport in Amsterdam had 20 events and Charles de Gaulle Airport in Paris had 15. The greatest number of events reported at any United States airport was 6, at John F. Kennedy in New York.

There were 31 multiple-engine events, yielding a rate of 9.8 per million operations. Three engines of a B747 ingested birds in one event. The other multiple-engine events all involved two engines of the aircraft. Fifty of the 676 engine ingestions are known to have involved multiple birds.

The Herring Gull, Common Rock Dove, Black-headed Gull, Common Lapwing, Black Kite, and Eurasian Kestrel were the most frequently identified bird species. Of these, all but the Eurasian Kestrel were also identified in the 1981-83 study. The first four were also the most frequently encountered birds during multiple-engine or multiple-bird ingestions. Fifty-nine percent of the events in which a species was identified involved a species that was also identified in the previous study.

Bird weights, both United States and foreign, are similar to those in the previous study. This is true not only in terms of summary statistics (median, mode, mean, etc.) but also in terms of the distribution functions for the weights. As before, the domestic weights tend to be heavier than foreign. There were no multiple-bird or multiple-engine ingestions for which a verified species was obtained that involved birds in the 1.5-pound weight class. In contrast, multiple-engine or multiple-bird ingestions of the 2.5-pound weight class were reported in 5 aircraft events.

Forty-seven percent of engines that ingested birds had some reported damage, compared to 62 percent in previous study. Fifty-four percent of current engine damage is classified as "minor," which typically consists of leading edge distortions or at most three bent, dented, or torn fan blades. Engine damage other than minor is called "significant".

The aircraft ingestion events were fairly evenly split between the departure (takeoff or climb) and arrival (descent, approach, or landing) phases of flight. However, engines ingesting birds during departures sustained damage at about twice the rate as in arrivals. It is verified statistically that engine damage and significant engine damage both tend to occur more often during departures than during arrivals. A similar analysis of the effect of bird multiplicity on

engine damage indicates that the higher rate of significant damage found in multiple-bird ingestions compared to single-bird ingestions is statistically significant but that the corresponding effect for any engine damage is inconclusive.

Four logistic regression models are fit for the occurrence of (1) any engine damage, (2) significant engine damage, (3) any fan blade damage, and (4) torn, cracked or broken fan blades, as functions of the predictor variables (i) bird weight, (ii) arrival/departure phase of flight, and (iii) single/multiple birds ingested. All three predictors are shown to be statistically significant in both the "significant engine damage" model (2) and the "any fan blade damage" model (3). However, only bird weight and phase of flight were necessary in the the "any engine damage" model (1) and only flight phase in the "broken fan blade" model (4).

Bird matter was found in the main gas path (core) of 183 (27 percent) of engines that ingested birds. Sixty-one of these had some physical core damage, in all cases to compressors. A surge or stall was reported in 31 engine ingestions. Seven surges were nonrecoverable.

An unscheduled crew action (aborted takeoff, air turnback, etc.) was performed in 14 percent of the aircraft events, which is half the rate in the previous study. There were 16 in-flight engine shutdowns (IFSD's), representing less than 3 percent of all engine events. No more than a single engine of any aircraft required in-flight shutdown or experienced engine failure. In the previous study, nearly 13 percent of engine events resulted in an IFSD. For events in which species identifications were made, birds in the 2.5-pound weight class were involved in 5 of 9 IFSD's, 12 of 49 crew actions, 4 of 11 engine failures and 2 of 5 uncontained events. In contrast, birds of the 1.5-pound class were identified in only 3 crew actions, 1 engine failure, and no IFSD's or uncontained events.

The engines included in the current study were designed and certificated to more stringent bird ingestion standards than most of those from the previous study. It is therefore not surprising that the current fleet has performed better in terms of the adverse effects of bird ingestions on engines and flights. However, one needs to simply recall the near-catastrophic B747 multiple-engine event in Los Angeles to be convinced that the ingestion of birds into engines continues to present a serious threat to aircraft safety.

Table 8.1 contains a summary of some data from the current and previous FAA studies. Except where noted, all numbers represent worldwide data.

TABLE 8.1 DATA SUMMARY

	CURRENT STUDY	1981-83 STUDY
No. of aircraft	1556	1513
No. of operations	3,163,020	2,738,320
No. of aircraft ingestions *	65/561/644	97/484/638
Ingestion rate (x 10^-4) *	0.70/2.52/2.04	0.99/2.80/2.33
No. of multiple-engine events	31	25
Multiple-engine ingestion rate (x 10^-6)	9.80	9.86
No. of engine events	676	666
No. of multiple-bird engine events	50	65
% Multiple-bird events	7.4	9.8
No. of damaging engine events	316	416
% Damaging engine events	47	62
Mean bird weight (oz.) *	24/20/21	30/27/27
Median bird weight (oz.) *	17/14/14	32/18/18.5
Modal bird weight (oz.) *	40/10/40	40/24/40
Modal bird weight class (lb.) *	2.5/0.5/0.5	2.5/0.5/0.5
No. of crew action a/c evts.	89	129
% Crew action events	13.8	28.2
No. of IFSD engine events	16	85
% IFSD's	2.4	12.8

* US/FOREIGN/WORLDWIDE

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10. GLOSSARY.

Aircraft operation - One complete flight cycle of an aircraft, from engine startup at departure to engine shutdown upon arrival.

Bird ingestion - The entrance of a bird into the inlet of a turbine engine during an aircraft operation.

Engine ingestion event - The simultaneous ingestion of one or more birds into an engine.

Aircraft ingestion event - The simultaneous ingestion of one or more birds into one or more engines of an aircraft.

APPENDIX A

BIRD INGESTION CERTIFICATION STANDARDS

The following is a summary of current bird ingestion certification standards as they pertain to engines in this study. The complete regulations, which were last amended in February 1984 are contained in 14 CFR 33.77. The small (3-ounce size) bird test has been omitted from the summary since it was not required for engines in this study.

TEST REQUIREMENT	MEDIUM BIRD TEST	LARGE BIRD TEST
BIRD SIZE	1.5 pound	4 pound
NO. OF BIRDS	1 for the first 300 square inches of inlet area plus 1 for each additional 600 square inches or fraction thereof.	1
MAXIMUM NUMBER OF BIRDS	8	1
BIRD SPEED	Initial climb speed of typical aircraft.	Liftoff speed of typical aircraft.
ENGINE OPERATION	Takeoff	Takeoff
INGESTION PATTERN	In rapid sequence to simulate a flock encounter and aimed at critical areas.	Aimed at critical areas.
POST-INGESTION REQUIREMENTS: Ingestion may NOT	1. Cause more than 25% sustained power or thrust loss. 2. Require engine shutdown within 5 minutes. 3. Result in a potentially hazardous condition.	Cause engine to: 1. Catch fire. 2. Burst. 3. Generate loads greater than maximum specified. 4. Lose capability of being shut down.

APPENDIX B

STATISTICAL TERMINOLOGY

Sample mean. The mean of a sample of size n is the average of the n numbers. It is obtained by summing the numbers and dividing by n.

Sample median. The median of a sample is the observation in the middle of the sample. That is, half the observations are at least as large as the median and half are as small as the median or smaller. We commonly find the median by sorting the sample and taking the middle observation, or observations, in the sorted sample. For example, the sample 1 3 2 6 8 is sorted to give 1 2 3 6 8, and the median is 3, the 3rd largest number. The sample 3 7 5 6 9 3 is sorted to give 3 3 5 6 7 9, and the median is 5.5, the average of the 3rd and 4th observations.

Sample mode. The mode is the most frequently occurring observation in the sample. In the 2nd example illustrating the median, the mode is 3. The mean, median, and mode are usually close together in a moderate size, or larger, sample whose histogram is bell-shaped.

Sample variance. The sample variance is computed in three steps: (1) Centering the sample, by subtracting the sample mean from each observation. (2) Squaring each centered observation. (3) Summing the squared centered observations. (4) Dividing by the sample size less 1, n - 1. The variance is the average squared deviation of the observations from their mean.

Sample standard deviation (SD). The sample standard deviation is the square root of the sample variance. It is a measure of the dispersion of the observations in the sample, that is, how far each observation is from the sample mean on the average. Typically, in a sample that has a histogram that resembles a bell-shaped curve, around 68 percent of the observations lie within one standard deviation of the samp]e mean, and 95 percent of the observations lie within two standard deviations of the sample mean.

Maximum, minimum, and range. The maximum and minimum of the sample are the largest and smallest observations in the sample, respectively. The range is the difference, maximum minus minimum.

Upper and lower quartiles, and interquartile range (IQR). The upper and lower quartiles are defined in a similar way to the median. One-quarter of the observations in the sample are at least as large as the upper quartile, and three-quarters of the observations are as small or smaller. These fractions are reversed in defining the lower quartile, so that three-quarters of the observations are at least as large as the lower quartile, and one-quarter of the observations are as small or smaller. The interquartile range is the difference, upper quartile minus lower quartile. It is an alternative measure of sample dispersion. When the histogram resembles a bell-shaped curve, the interquartile range is about 1.35 times as large as the standard deviation.

Outliers. Outliers are observations that are exceptionally large or small, so that they appear to be atypical of the majority of observations in the sample. For example, the sample 1 4 3 5 15 contains a single outlier 15. The choice of observations to call outliers is aided by an outlier cutoff rule. For example,

using the so-called standard boxplot rule, an observation is a high outlier if it is larger than the upper quartile by at least 1.5 times the interquartile range. There are several alternative outlier cutoff rules, and judgement must play an important role in first selecting observations to classify as outliers and then which outliers to remove from the sample. If the sample includes outliers, the sample mean will be pulled towards those observations and the standard deviation will be markedly larger than when the outliers are excluded. The minimum, maximum, and range of the sample are very affected by outliers. The sample median and the interquartile range are not affected by outliers. The sample median and interquartile range are so-called resistant summaries of center and dispersion, respectively. All these alternatives may be included in a selection of summary statistics (e.g., tables 4.4, 4.5, 8.1).

Cumulative distribution function. The cumulative distribution function at a given value (of bird weight, for example) is the fraction of observations less than or equal to that value. For example, the cumulative distribution function of the sample 1 3 3 4 is 0 for any value less than 1; is the fraction 1/4 for any value equal to or greater than 1 but less than 3; is the fraction 3/4 for any value equal to or greater than 3 but less than 4; and is 1 for any value equal to or greater than 4.

Kolmogorov-Smirnov two-sample test. The distributions of two samples can be compared using the Kolmogorov-Smirnov test. It is a nonparamctric procedure, meaning that few theoretical assumptions are made about populations from which the two samples were obtained. The Kolmogorov-Smirnov test is based on the largest absolute difference between the two cumulative distribution functions at any value (bird weight). If the difference is large, the two distributions are judged to be different. Tables and statistical algorithms are available to compute *P*-values and critical values to use in deciding how different the distributions are and whether the difference is significant.

***P*-value**. In statistical testing, it is usual to state a null hypothesis; for example, that there is no difference between two distributions. Of course the two samples are different, e.g., the cumulative distribution functions of bird weights are different, the means are different, or the proportions of significant damage in the samples of engine events for departures and arrivals, respectively, differ. But some differences are expected by chance even if each sample is chosen at random from a common pool or population. The *P*-value is the probability that a difference as large or larger than the observed difference between the two samples will be observed if two samples of the given sizes are drawn from the same population. The largest absolute difference used in the Kolmogorov-Smirnov test is a specific way of measuring the difference between the distributions of two samples. Another would be the difference between proportions of significant damage. A *P*-value of 5 percent or lower is commonly interpreted to mean that the observed difference is unlikcly to have occurred by chance, so that there is strong evidence for a substantive difference between the populations from which the two samples were obtained. When the *P*-value is larger than 5 percent, we are more willing to accept the possibility that the two populations are the same. That does not mean that we have proved that they are the same, only that the evidence for a difference is weaker. A *P*-value around 10 percent can be interpreted as weak evidence that the populations are not the same. A *P*-value around 40 percent is no evidence at all. A *P*-value less than 1 percent is very strong evidence.

Critical value. The choice of *P*-value of 5 percent as a dividing point between accepting the null hypothesis if $P > 5$ percent or not appears to be based on a historical perception of what is an unlikely event. An event is "unlikely" if the probability of occurring is less than 5 percent. Other choices are perfectly permissible, for example when we wish to strongly "protect" the null hypothesis, and not declare that there is a difference unless the evidence, measured by a small *P*-value is very convincing. The critical value is the *P*-value, often 5 percent, sometimes 1 percent, at which we make this declaration. For example, it may be the value of the largest absolute difference in the Kolmogorov-Smirnov test when the *P*-value equals 5 percent. The critical value will depend on the sample sizes involved.

Chi-square test. Counts of events are often arranged in a two-way table, with levels of two factors, for example damage severity and number of birds, represented by the rows and columns, respectively. These factors will be dependcnt if the proportion of engines with significant damage is larger (or perhaps smaller) among engines ingesting only one bird than among engines ingesting more than one bird. There is a symmetry to these statements: Equivalently we can say that engine events where there is significant damage involve multiple bird ingestions in a disproportionately high fraction of cases, relative to engine events where there is no damage or only minor damage.

When there is no dependence, the row and column factors are said to be independent. When the row and column factors are independent, the typical, or expected, number of observations in a given cell of the two-way table is simply the product of the row and column totals for that cell divided by the overall total. For example, in figure 5.1 there are 129 engine events with significant damage, and 589 out of 636 engine events involve only a single bird. Therefore, if damage severity and number of birds were independent, the number of engine events with significant damage where a single bird is ingested would be around 129 x 589/636, or 119 (after rounding). The observed number is 109. As described above, the observed numbers will always differ from the expected numbers, whether or not the two factors are independent. However, larger differences will typically occur when the factors are dependent than when they are independent. (The differences are both positive and negative, since each row total and column total must be the same using either the observed or expected number of observations.) The chi-square statistic is computed by summing the differences over all the cells of the table, specifically using the formula

$$chi\text{-}square = \sum_{all\ cells} \frac{(observed - expected)^2}{expected}$$

When the factors are independent, and the expected number of observations in each cell is not too small (at least 5, for example), the chi-square statistic is said to have an approximate chi-square distribution on (r - 1) x (c - 1) degrees of freedom (df), where r and c are the number of rows and columns in the table, respectively. The *P*-values and critical values are computed based on this distribution (using tables or algorithms) and, as with the Kolmogorov-Smirnov test, are used as evidence for and against the null hypothesis that the differences in the relative proportions between rows (or columns) of the table are due to chance fluctuations alone.

Probability of a difference. When a P-value of, for example, 14 percent is computed for a chi-square test, the claim might be made that the probability that the two factors are dependent is 86 percent. Analogously, when a P-value of 3 percent occurs using the Kolmogorov-Smirnov test, the claim might be made that the probability that the two populations are the same is only 3 percent. The probability that the two populations are different is 97 percent. These claims are justifiable if additional, Baysian, assumptions are made about the data. They give an impression of the weight of evidence, which is the interpretation used above.

Poisson assumption. Each estimate in section 5.7 of the number of US events in a particular damage category , when corrected for the undercount, is a ratio involving 3 numbers. For example, the estimate of the number of no damage events is 27 x 311 / 106. The Poisson approximation involves assuming that each count follows a Poisson distribution with mean equal to some λ (different for each count). Estimating the Poisson parameter λ by the count, e.g. $\hat{\lambda} = 27$, the variance in the expressed as a proportion of the count is $1/\hat{\lambda}$. Using the delta method and substituting the counts as estimates for the respective λ gives a confidence interval for the number of no damage events equal to

$$27 \times \frac{311}{106} \times \left(1 \pm 1.96\sqrt{\frac{1}{311} + \frac{1}{27} + \frac{1}{106}}\right).$$

Repeated independent events. For probability p that a given bird causes fan blade damage, the probability that the bird causes no damage is 1 - p. Assuming that the effects of impacts of successive birds are independent, the probability of no fan blade damage from the strikes of two birds is

$$(1 - p) \times (1 - p),$$

for three birds is

$$(1 - p) \times (1 - p) \times (1 - p),$$

and so on. The probabilities of fan blade damage are, respectively,

$$1 - [(1 - p) \times (1 - p)]$$

for two birds, and

$$1 - [(1 - p) \times (1 - p) \times (1 - p)]$$

for three birds.

Logistic regression. Logistic regression is used to model the proportion of damaging events as a function of the predictor variables bird weight, phase of flight, and bird multiplicity. The logistic regression model asserts that the probability of damage is a "logistic" function of a linear combination of the predictor variables. Suppose there is just one predictor, say bird weight w. Then the linear combination is b_0+b_1w for some coefficients b_0 and b_1. The probability of damage is

$$P(w) = \frac{\exp(b_0+b_1w)}{1 + \exp(b_0+b_1w)}$$

The probability of damage is found to increase with bird weight. Since the probability P increases with the value of the linear combination, the coefficient b_1 is positive.

If phase of flight is included as a second predictor, then a third coefficient, b_2, is introduced. The probability of damage is

$$P(w) = \frac{\exp(b_0+b_1w-b_2)}{1+\exp(b_0+b_1w-b_2)}$$

on arrival, and

$$P(w) = \frac{\exp(b_0+b_1w+b_2)}{1+\exp(b_0+b_1w+b_2)}$$

on departure. For models fitted in this report, the probability on departure was higher than on arrival; accordingly, the coefficient b_2 is positive.)

Bird multiplicity might be included as a third predictor, with coefficient b_3. Then there are four different expressions for $P(w)$. For example, for multiple bird ingestions on arrival,

$$P(w) = \frac{\exp(b_0+b_1w-b_2+b_3)}{1+\exp(b_0+b_1w-b_2+b_3)}$$

Since the probability of damage is higher with multiple bird ingestions, $b_3 > 0$.

Only those predictors are included in the fitted model whose contribution to explaining the pattern of events is statistically significant at 5 percent. The selection of predictors to include proceeds stepwise. Initially, only a constant term (b_0) is included in each model. Then the single predictor that explains the most is included. Then a second predictor may be included, if it is statistically significant, and so on. Interactions are also considered, that is, the coefficient (b_1) of weight may be different for departures and for arrivals. However, no interaction terms were found to be statistically significant.

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APPENDIX C

AIRCRAFT INGESTIONS BY AIRPORT - WITH AIRCRAFT TYPE AND BIRD SPECIES

This appendix lists all airports at which bird ingestions are known to have occurred. The airports are organized into the eight geographical regions introduced in section 3.9. The aircraft events are tallied by aircraft type for each airport. All verified bird identifications are also tallied, by species code, at each airport. The English and scientific names for each bird species can be found in appendix D.

N.AMERICA

AIRPORT	LOCALE	A300	A310	A320	B747	B757	B767	DC10	MD11	AIRPORT TOTALS	BIRD SPECIES
*ANC	ANCHORAGE,ALASKA				2					2	L2c19,Z57a38
BOS	BOSTON,MASS.					1	1			2	P5a24
DCA	WASHINGTON-NATIONAL,DC					1				1	J3a1
EWR	NEW YORK-NEWARK,NJ	1				1				2	P5a24
FAR	FARGO,N.DAKOTA					1				1	P5a40
JFK	NEW YORK-JFK,NY	1			3	1	1			6	M5b141(2),P5a24(4)
LAX	LOS ANGELES,CAL.				1	1	1			3	K2c7,P5a19,Q3a1
MCO	ORLANDO,FLORIDA					1	1			2	
MEM	MEMPHIS,TENN.					1				1	Z21a325
MIA	MIAMI,FLORIDA					2				2	P5a14
MSY	NEW ORLEANS,LA					1				1	P5a14
ORD	CHICAGO,ILLINOIS				1	2	1			4	P5a14,Q3a108
PAE	EVERETT,WASHINGTON				4					4	L2c19,T4a5
PIE	ST.PETERSBURGH,FLA.					1				1	
SAP	SAN PEDRO,SULA,HONDURAS			1						1	
SFO	SAN FRANCISCO,CAL.						1			1	I1b2
SLC	SALT LAKE CITY,UTAH					1				1	
SNA	ORANGE COUNTY,CALIFORNIA			1		1				2	Q3a1
XFO	UNKNOWN,CANADA					1	1			2	L2e40
XUS	UNKNOWN,US	2	1	5	1	14	5		1	29	J5b11,Q3a108(3),Z14a83,Z21a253,Z21a325
XXX	UNKNOWN,N.AMERICA					1	1			2	
YUL	MONTREAL, CANADA			1						1	P5a14
YVR	VANCOUVER, CANADA		1				1			2	P5a20,P5a24
YYC	CALGARY,CANADA						1			1	
YYZ	TORONTO, CANADA						2			2	
	REGION TOTALS	4	2	8	12	32	17	0	1	76	

EUROPE

AIRPORT	LOCALE	AIRCRAFT A300	A310	A320	B747	B757	B767	DC10	AIRPORT TOTALS	BIRD SPECIES
ABZ	ABERDEEN,SCOTLAND,UK			2					2	
AMS	AMSTERDAM,NETHERLANDS		5	1	9	3	2		20	M5b59,M5b141(3),P5a35,P14a1,Q3a9
BCN	BARCELONA,SPAIN	1							1	P5a24
BEG	BELGRADE,YUGOSLAVIA			1					1	J5b12
BFS	BELFAST,N.IRELAND,UK					3			3	P14a1(3)
BIA	BASTIA,CORSICA,FRANCE			1					1	J5b12
BIQ	BIARRITZ,FRANCE			1					1	
BRE	BREMEN,GERMANY		2	3					5	
BRU	BRUSSELS,BELGIUM		2	1					3	P14a1,Q3a1,Z51a31
BSL	BASEL/MULHOUSE,SWITZERLAND			2		1			3	
BUD	BUDAPEST,HUNGARY					1			1	P5a12
CDG	PARIS-CDG,FRANCE		2	8	4	1			15	M5b59,P5a24,P5a35,P14a1,Q3a9,Z53a82(2)
CFU	CORFU,GREECE		1						1	J4a46
CPH	COPENHAGEN,DENMARK						2		2	J5b12
DUS	DUSSELDORF,GERMANY		3	4					7	P14a1,Q3a9,U3b68
FCO	ROME-DA VINCI,ITALY			3					3	P5a16,P5a35
FNI	NIMES,FRANCE			1					1	
FRA	FRANKFURT,GERMANY		2	2	1				5	U3b68
GRQ	GRONINGEN,NETHERLANDS						1		1	M5b16
GVA	GENEVA,SWITZERLAND					2			2	J5b18
HAM	HAMBURG,GERMANY		2	1	1	1			5	
HER	HERAKLION,GREECE						1		1	Z14a83
IBZ	IBIZIA,SPAIN	1							1	P5a24
KEV	KEVLAVICK,ICELAND					1			1	
LBA	LEEDS-BRADFORD,ENGLAND,UK		1						1	
LEJ	LEIPZIG,GERMANY		1	1					2	
LGW	LONDON-GATWICK,ENGLAND,UK					1	1		2	
LHA	LAHR,GERMANY					1			1	
LHR	LONDON-LHR,ENGLAND,UK			2		2			4	
LIL	LILLE,FRANCE			6					6	K1a2,P5a24,Q3a9
LIN	MILAN-LIN,ITALY			1					1	
LJU	LJUBLJANA,YUGOSLAVIA			1					1	J5b12
LTN	LONDON-LUTON,ENGLAND,UK						1		1	M5b59
LXS	LEMNOS, GREECE				1				1	P5a24
LYS	LYON,FRANCE			4					4	J5b12(2),Qa39
MAN	MANCHESTER,ENGLAND,UK						1		1	
MGQ	MISKOLC,HUNGARY		1						1	
MLH	MULHOUSE/BASEL,FRANCE			1					1	
MRS	MARSEILLE,FRANCE			1					1	Z15b39
MUC	MUNICH,GERMANY		1				3		4	P5a35,P14a1
NAP	NAPLES,ITALY			1					1	
NCE	NICE,FRANCE		1	3					4	P5a24,P5a35,Z14a81

EUROPE (CONTINUED)

AIRPORT	LOCALE	A300	A310	A320	B747	B757	B767	DC10	AIRPORT TOTALS	BIRD SPECIES
NTE	NANTES,FRANCE		1						1	
NUE	NUREMBERG,GERMANY			3					3	
ORY	PARIS-ORLY,FRANCE	1	1	6			1		9	P5a35,J5b12(2),Z65c3,Q3a9(2)
PIK	PRESTWICK,SCOTLAND,UK		1						1	P5a24
PMI	PALMA,MALLORCA,SPAIN					2			2	Z15b31
PMO	PALERMO,ITALY		1						1	Q3a1
PRG	PRAGUE,CZECHOSLAVAKIA		1						1	
SVO	MOSCOW-SHEREMETYE,RUSSIA				1				1	
SXB	STRASBOURG,FRANCE			1					1	J4a180
SXF	E.BERLIN,GERMANY		2						2	M5b59
TIV	TIVAT,YUGOSLAVIA			1					1	P5a24
TLS	TOULOUSE,FRANCE		2	2					4	P5a35
VCE	VENICE,ITALY					1			1	
VIE	VIENNA,AUSTRIA		1						1	P5a35
WAW	WARSAW,POLAND						3		3	P5a35(3)
XFO	UNKNOWN,EUROPE		1		2	6	1		10	
ZRH	ZURICH,SWITZERLAND			1					1	
	REGION TOTALS	3	35	66	19	26	17	0	166	

S.AMERICA

AIRPORT	LOCALE	A300	A310	A320	B747	B757	B767	DC10	AIRPORT TOTALS	BIRD SPECIES
BGI	BARBADOS,BARBADOS	1							1	
BUE	BUENOS AIRES,ARGENTINA				1				1	
CCS	CARACUS,VENEZUELA	1							1	J1a2
EZE	BUENOS AIRES-PISTARINI,ARG						1		1	J5a10
GRU	SAO PAULO,BRAZIL						1		1	J1a1
IGU	IGUASSA FALLS,BRAZIL						1		1	
LIM	LIMA, PERU						1		1	
MAO	MANUS,BRAZIL						1		1	
REC	RECIFE,BRAZIL						1		1	
	REGION TOTALS	2	0	0	1	0	6	0	9	

ASIA

AIRPORT	LOCALE	A300	A310	A320	B747	B757	B767	DC10	AIRPORT TOTALS	BIRD SPECIES
AMD	AHMEDABAD,INDIA			2					2	
BLR	BANGALORE,INDIA			1					1	
BOM	BOMBAY,INDIA	2	1	1	1				5	J4a31,K1a2
CCU	CALCUTTA,INDIA		1						1	
DEL	DELHI,INDIA		1	2	3				6	J4a31,J4a48
HKG	HONG KONG				2				2	J4a31
KHI	KARACHI,PAKISTAN	1	1						2	
KTM	KATHMANDU,NEPAL					1			1	
KUH	KUSHIRO,INDIA						1		1	
PAU	PAUK,BURMA			1					1	
PEK	BEIJING,CHINA							1	1	P14a12
PUS	PUSAN,KOREA	1					1		2	P17d9
SEL	SEOUL,KOREA	3					1		4	I1a13,U3b43,Z14a81
SHA	SHANGHAI,CHINA	1							1	Q3a1
TRV	TRIVANDRUM,INDIA		1						1	
XFO	UNKNOWN,ASIA					3			3	
	REGION TOTALS	8	5	7	6	4	3	1	34	

AUSTRALIA-NEW ZEALAND

AIRPORT	LOCALE	A300	A310	A320	B747	B757	B767	DC10	AIRPORT TOTALS	BIRD SPECIES
ADL	ADELAIDE,AUSTRALIA				1				1	P5a32
AKL	AUCKLAND,NEW ZEALAND						1		1	
BNE	BRISBANE,AUSTRALIA		1						1	
LST	LAUNCESTON,AUSTRALIA			1					1	P14a6
PER	PERTH,AUSTRALIA						1		1	P14a5
RMA	ROMA,AUSTRALIA			1					1	
SYD	SYDNEY,AUSTRALIA			1	1		1		3	P5a32
WLG	WELLINGTON,NEW ZEALAND						1		1	P5a32
	REGION TOTALS	0	1	3	2	0	4	0	10	

PACIFIC

AIRPORT	LOCALE	A300	A310	A320	B747	B757	B767	DC10	AIRPORT TOTALS	BIRD SPECIES
AXT	AKITA,JAPAN				1		1		2	
BKK	BANGKOK,THAILAND		1		1		1		3	K1a2
CGK	JAKARTA-SOEKARNO,INDONESIA	1							1	
DPS	DENPASAR,BALI	1							1	
FUK	FUKUOKA,JAPAN						3	1	4	Q3a1
HIJ	HIROSHIMA,JAPAN						3		3	
HND	TOKYO-HND,JAPAN				2		8		10	I1b2,L2e69,P14a12
JKT	JAKARTA,INDONESIA				1				1	
KCZ	KOCHI,JAPAN						7		7	
KIJ	NIGATA,JAPAN						1		1	L2e34
KMI	MIYAZAKI,JAPAN						1		1	
KMJ	KUMAMOTO,JAPAN						2		2	
MES	MEDAN,INDONESIA						1		1	
MYJ	MATSUYAMA,JAPAN						8		8	
NAN	NADI,FIJI				1				1	J4a82
NGO	NAGOYA,JAPAN						3	2	5	BAT
NRT	TOKYO-NRT,JAPAN				2		1		3	L2e34,Q3a1
OIT	OITA,JAPAN						2		2	
OKA	OKINAWA,JAPAN						1	1	2	
OKJ	OKAYAMA,JAPAN						3		3	
OSA	OSAKA,JAPAN						2		2	
PEN	PENANG,MALAYSIA		2						2	
SDJ	SENDAI,JAPAN						4		4	
SHI	SHIMOJISHIMA,JAPAN						2		2	I1a23
SIN	SINGAPORE		1		2				3	J4a31
SPK	SAPPORO,JAPAN				1		3	1	5	J4a31(2),L2e60,U3b70
TAK	TAKAMATSU,JAPAN						3		3	
TOY	TOYAMA,JAPAN						5		5	
TPE	TAIPEI,TAIWAN				1				1	BAT(2)
TTJ	TOTTORI,JAPAN						1		1	
XFO	UNKNOWN,PACIFIC	1	1		8		4	4	18	I1d6,P5a11,P17d9,U3b70,Z14a81,BAT
	REGION TOTALS	2	4	0	18	0	68	9	101	

AFRICA

AIRPORT	LOCALE	A300	A310	A320	B747	B757	B767	DC10	AIRPORT TOTALS	BIRD SPECIES
BJL	BANJUL,GAMBIA		1						1	
CAI	CAIRO,EGYPT		1						1	
CAS	CASABLANCA,MOROCCO		1						1	
EBB	ENTEBBE,UGANDA		1						1	J4a36
FNA	FREETOWN,SIERRA LEONE		2						2	
HRE	HARARE,ZIMBABWE	1					2		3	K2a57,M3a3,Z15b55
KRT	KHARTOUM,SUDAN	1							1	Q3a62
MBA	MOMBASA,KENYA		4						4	I1a7,J4a31,J4a36
MRU	MAURITIUS,MAURITIUS						1		1	
NBO	NAIROBI,KENYA	1	3				2		6	I1a7,J4a31(2),M3a3
RBA	RABAT,MOROCCO					1			1	
TUN	TUNIS,TUNISIA			2					2	
WDH	WINDHOEK,NAMIBIA				1				1	
XFO	UNKNOWN,AFRICA						1		1	J5b44
	REGION TOTALS	3	13	2	1	1	6	0	26	

MIDDLE EAST

AIRPORT	LOCALE	A300	A310	A320	B747	B757	B767	DC10	AIRPORT TOTALS	BIRD SPECIES
AMM	AMMAN,JORDAN		1						1	P9a1
ANK	ANKARA,TURKEY		1						1	
AYT	ANTALYA,TURKEY		1						1	J4a46
DHA	DHAHRAN,SAUDI ARABIA	1							1	P5a24
ESB	ANKARA-ESENBOGA,TURKEY		1	1					2	
ETH	ELAT,ISRAEL						1		1	Q3a1
IST	ISTANBUL,TURKEY		7		1	1			9	P5a24,P5a35(2)
JED	JEDDAH,SAUDI ARABIA	4							4	Q3a1
LCA	LARNACA,CYPRUS		3						3	M5b12,P14a1
PFO	PAPHOS,CYPRUS		1						1	K2c7
RUH	RIYADH,SAUDI ARABIA	1							1	
SHJ	SHARJAH,UA EMIRATES		1				1		2	
TLV	TEL AVIV,ISRAEL					1	2		3	M5b12
XFO	UNKNOWN,MIDDLE EAST	2							2	J4a31
	REGION TOTALS	8	16	1	1	2	4	0	32	

APPENDIX D

INGESTED BIRDS - ORDERS, FAMILIES, SPECIES, CODES

The 77 distinct species of ingested birds that were identified by ornithologists are listed by order and family in this appendix. The English and scientific names and the new code from [4], as well as the old code from a previous edition, are given for each. There is also a tally of the number of aircraft events in which each species was found to be involved, broken down by month of year.

ORDER	FAMILY	NEW CODE	OLD CODE	SCIENTIFIC NAME		ENGLISH NAME	NO. EVTS.	1	2	3	4	5	6	7	8	9	10	11	12
											MONTHLY TOTALS								
Ciconiiformes 9 EVENTS	Ardeidae	I1a7	1I59	Ardea	melanocephala	BLACK-HEADED HERON	2		1			1							
		I1a13	1I52	Egretta	alba	GREAT EGRET	1									1			
		I1a23	1I50	Egretta	garzetta	LITTLE EGRET	1					1							
		I1b2	1I24	Nycticorax	nycticorax	BLACK-CROWNED NIGHT-HERON	4	1			1				1	1			
		I1d6	1I9	Ixobrychus	eurhythmus	SCHRENDK'S BITTERN	1									1			
Falconiformes 37 EVENTS	Cathartidae	J1a1	1K4	Cathartes	atratus	BLACK VULTURE	2		1						1				
		J1a2	1K1	Cathartes	aura	TURKEY VULTURE	1				1								
	Pandionidae	J3a1	2K1	Pandion	haliaetus	OSPREY	1				1								
	Accipitridae	J4a31	3K28	Milvus	migrans	BLACK KITE	11	1		2		1	2		1	2		1	1
		J4a36	3K34	Haliaeetus	vocifer	AFRICAN FISH EAGLE	2					1				1			
		J4a46	3K43	Neophron	percnopterus	EGYPTIAN VULTURE	2				1			1					
		J4a48	3K46	Gyps	bengalensis	INDIAN WHT-BCKD VULTURE	1								1				
		J4a82	3K75	Circus	spilonotus	EURASIAN MARSH HARRIER	1	1											
		J4a180	3K180	Buteo	buteo	COMMON BUZZARD	2					1					1		
	Falconidae	J5a10	5K8	Milvago	chimango	CHIMANGO FALCON	1			1									
		J5b11	5K26	Falco	sparverius	AMERICAN KESTREL	1								1				
		J5b12	5K27	Falco	tinnunculus	EURASIAN KESTREL	9						1	6	1		1		
		J5b18	5K24	Falco	rupicoloides	GREATER KESTREL	1							1					
		J5b43	5K55	Falco	rusticolus	GYRFALCON	1					1							
		J5b44	5K59	Falco	peregrinus	PEREGRINE FALCON	1			1									
Strigiformes 8 EVENTS	Tytonidae	K1a2	1S2	Tyto	alba	COMMON BARN OWL	5			1					1		2		1
	Strigidae	K2a57	2S44	Bubo	africanus	AFRICAN EAGLE OWL	1	1											
		K2c7	2S124	Asio	flammeus	SHORT-EARED OWL	2			1								1	
Anseriformes 8 EVENTS	Anatidae	L2c19	2J30	Branta	canadensis	CANADA GOOSE	2				1					1			
		L2e30	2J84	Anas	platyrhynchos	MALLARD DUCK	1		1										
		L2e34	2J91	Anas	poecilorhyncha	SPOT-BILLED DUCK	2				1							1	
		L2e40	2J95	Anas	acuta	COMMON PINTAIL DUCK	1	1											
		L2e60	2J115	Aythya	ferina	COMMON POCHARD	1	1											
		L2e69	2J124	Aythya	marila	GREATER SCAUP	1		1										
Galliformes 14 EVENTS	Numididae	M3a3	5L3	Numida	meleagris	HELMETED GUINEA FOWL	2		2										
	Pasianidae	M5b12	4L37	Alectoris	chukar	CHUKAR	2						1				1		
		M5b16	4L41	Alectoris	rufa	RED-LEGGED PARTRIDGE	1								1				
		M5b59	4L85	Perdix	perdix	HUNGARIAN PARTRIDGE	4	1	1								1	1	
		M5b141	4L161	Phasianus	colchicus	RING-NECKED PHEASANT	5			1	1				1		1	1	
Charadriiformes 65 EVENTS	Laridae	P5a11	14N10	Larus	crassirostris	BLACK-TAILED GULL	1										1		
		P5a12	14N13	Larus	canus	COMMON GULL	1											1	
		P5a14	14N12	Larus	delawarensis	RING-BILLED GULL	4							1			1		2
		P5a16	14N21	Larus	marinus	GREAT BLACK-BACKED GULL	1							1					
		P5a19	14N19	Larus	occidentalis	WESTERN GULL	1							1					
		P5a20	14N22	Larus	glaucescens	GLAUCOUS-WINGED GULL	1									1			
		P5a24	14N14	Larus	argentatus	HERRING GULL	17	2		2		2	2	4	2	2		1	
		P5a32	14N32	Larus	novaehollandiae	SILVER (RED-BILLED) GULL	3			1			1	1					
		P5a35	14N36	Larus	ridibundus	BLACK-HEADED GULL	14		1	1	1	1		1	2	3		2	2

ORDER	FAMILY	NEW CODE	OLD CODE	SCIENTIFIC NAME		ENGLISH NAME	NO. EVTS.	MONTHLY TOTALS 1	2	3	4	5	6	7	8	9	10	11	12
Charadriiformes (continued)	Laridae	P5a40	14N31	Larus	pipixcan	FRANKLIN'S GULL	1										1		
		P5b15	14N58	Sterna	dougallii	ROSEATE TERN	1						1						
		P5b33	14N74	Sterna	albifrons	LEAST TERN	1							1					
	Burhinidae	P9a1	9N1	Burhinus	oedicnemus	EURASIAN STONE-CURLEW	1										1		
	Charadriidae	P14a1	5N1	Vanellus	vanellus	COMMON LAPWING	9	1	2	1		1				1		1	2
		P14a5	5N23	Vanellus	tricolor	BANDED PLOVER	1							1					
		P14a6	5N24	Vanellus	miles	MASKED PLOVER	1			1									
		P14a12	5N20	Hoplopterus	cinereus	GRAY-HEADED LAPWING	2					1			1				
		P14b6	5N33	Charadrius	vociferus	KILLDEER	1							1					
		P14b37	5N26	Pluvialis	dominica	LESSER GOLDEN PLOVER	1	1											
	Scolopacidae	P17b1	6N30	Arenaria	interpres	RUDDY TURNSTONE	1						1						
		P17d9	6N47	Gallinago	gallinago	COMMON SNIPE	2		1								1		
Columbiformes 23 EVENTS	Columbidae	Q3a1	2P1	Columba	livia	COMMON ROCK DOVE	11			1	2		1	3		1		2	1
		Q3a9	2P9	Columba	palumbus	COMMON WOOD PIGEON	7			1	2		2	1	1				
		Q3a62	2P61	Streptopelia	capicola	RING-NECKED DOVE	1					1							
		Q3a108	2P105	Zenaida	macroura	AMERICAN MOURNING DOVE	4		1						1		2		
Cuculiformes 1 EVENT	Cuculidae	S2f24	2R127	Centropus	senegalensis	SENEGAL COUCAL	1										1		
Caprimulgiformes 2 EVENTS	Caprimulgidae	T4a5	5T5	Chordeiles	minor	COMMON NIGHTHAWK	1									1			
		T4b49	5T55	Caprimulgus	donaldsoni	DON-SMITH'S NIGHTJAR	1								1				
Apodiformes 6 EVENTS		U3b43	1U33	Chaetura	pelagica	CHIMNEY SWIFT	2							1	1				
		U3b68	1U55	Apus	apus	COMMON SWIFT	2						1	1					
		U3b70	1U70	Apus	pacificus	FORK-TAILED SWIFT	2						1		1				
Passeriformes 21 EVENTS	Alaudidae	Z14a81	17Z72	Alauda	arvensis	COMMON SKYLARK	5				3				1			1	
		Z14a83	17Z74	Eremophila	alpestris	HORNED LARK	3									1	2		
	Hirundinidae	Z15b31	18Z29	Riparia	riparia	COMMON SAND MARTIN	1					1							
		Z15b39	18Z37	Hirundo	rustica	BARN SWALLOW	2				1				1				
		Z15b55	18Z55	Hirundo	semirufa	RUFOUS-BREASTED SWALLOW	1	1											
	Motacillidae	Z17a41	47Z36	Anthus	pratensis	MEADOW PIPIT	1								1				
	Turdidae	Z21a253	41Z246	Catharus	ustulatus	SWAINSON'S THRUSH	1									1			
		Z21a325	41Z314	Turdus	migratorius	AMERICAN ROBIN	2				1				1				
	Corvidae	Z51a31	22Z94	Corvus	corone	CARRION CROW	1								1				
	Sturnidae	Z53a82	21Z75	Sturnus	vulgaris	COMMON STARLING	2	1									1		
	Parulidae	Z57a38	63Z20	Dendroica	coronata	YELLOW-RUMPED WARBLER	1									1			
	Emberizidae	Z65c3	68Z166	Emberiza	calandra	CORN BUNTING	1								1				
							194	13	12	15	17	13	14	26	25	19	18	13	9

APPENDIX E

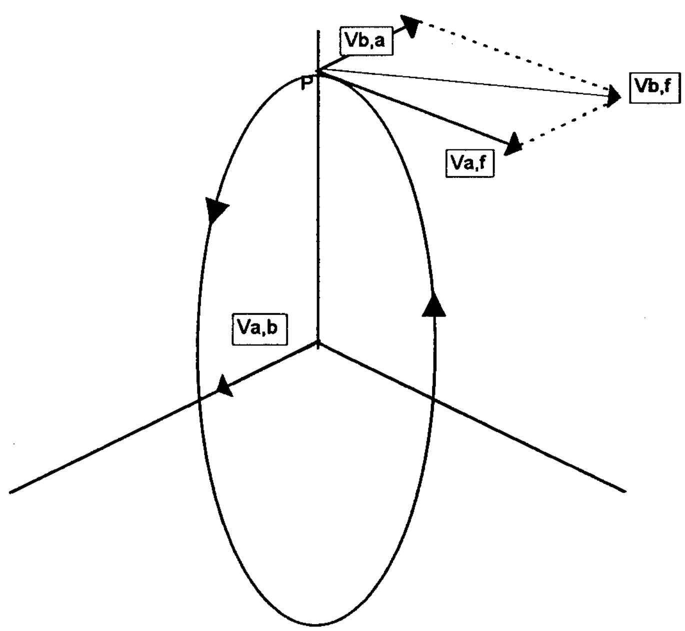
IMPACT SPEED OF BIRD WITH FAN BLADE - BY FLIGHT PHASE AND SPAN LOCATION

In this appendix approximate impact speeds of bird with fan blade are computed for various phases of flight and span locations. The bird's velocity at ingestion is rarely known. However its speed in flight is usally small relative to that of the aircraft. Hence an assumption that the bird is stationary in air at impact is both a practical and acceptable necessity. It follows from this assumption that the bird hits the fan in the axial direction and that the relative velocity of bird with fan blade (impact velocity) is completely determined by aircraft speed, fan RPM, dimension (root and tip radii) of fan blade, and spanwise (radial) location of impact. The figure illustrates how the impact velocity (Vb,f) is derived from aircraft velocity and tangential velocity of fan at the point of impact.

P = point of impact

Vx,y = relative velocity of x with respect to y

a = aircraft
b = bird
f = fan



Dimensions of the CF6-80C2 fan blade were used for the computations in the table. This blade has a root radius of 16.5 inches and tip radius of 46.5 inches. The same engine's nominal N1 speed of 3300 RPM was also assumed. Representative aircraft speeds and percent of fan N1 were chosen for eight phases of flight. Impact speed computations, as shown below, were made at four spanwise locations for each flight phase. Spans of 0 percent and 100 percent represent impacts at the blade's root and tip, respectively. Intermediate impact locations are at 30 percent and 70 percent of blade length.

As expected, the impact speeds tend to be greatest in departure phases. They are, however, extremely sensitive to span location, varying two or three times in magnitude from root to tip in most cases. Indeed, impact speeds near the blade tip during final approach exceed those near the root for departure phases. The aircraft and fan speed parameters for thrust reverse are typical at full thrust reverser initiation. Although the resultant impact speeds are high, fan speed drops abruptly to taxi idle in about 10 seconds and aircraft speed (hopefully) decreases rapidly during this time. Since the aircraft is already on the ground, bird ingestion during thrust reversal does not usually represent a threat to flight safety.

PHASE OF FLIGHT	*BIRD/FAN BLADE RELATIVE SPEED (FT/SEC) AT GIVEN FAN BLADE SPAN*			
	0%	*30%*	*70%*	*100%*
TAKEOFF (V1) A/C SPEED=150 KTS 100% FAN N1	*538*	*777*	*1109*	*1363*
MAXIMUM CLIMB A/C SPEED=250 KTS 95% FAN N1	*618*	*815*	*1109*	*1340*
DESCENT A/C SPEED=250 KTS 35% FAN N1	*454*	*494*	*566*	*631*
FINAL APPROACH A/C SPEED=160 KTS 65% FAN N1	*410*	*548*	*752*	*911*
LANDING A/C SPEED=150 KTS 40% FAN N1	*317*	*388*	*501*	*592*
THRUST REVERSE A/C SPEED=130 KTS 95% FAN N1	*502*	*731*	*1049*	*1291*
TAXI A/C SPEED=25 KTS 20% FAN N1	*104*	*153*	*220*	*271*

APPENDIX F

SUMMARY OF DATA BASE CONTENTS

This appendix summarizes the contents of the FAA data base used to generate this report. Each line of information pertains to a unique engine ingestion event. The events are ordered chronologically. Unless otherwise specified, "N" denotes "no" or "none" and a "blank" entry means the information is "unknown."

The column headings are defined as follows:

DATE	Date of ingestion
EVT	Aircraft ingestion event number (repeated in last column)
A/C	Aircraft type
ENG	Engine model
DASH	Engine model dash
POS	Engine position
TIME	Time of ingestion
POF	Phase of flight (TR=takeoff roll, TO=takeoff, TC=takeoff or climb, CL=climb, CR=cruise, DE=descent, AP=approach, LA=landing or approach, LD=landing, LR=landing roll, RV=thrust reverse, TX=taxi)
SIGEVT	Significant Event (SEMB=single engine-multiple bird, MEMB=multiple engine-multiple bird, MESB=multiple engine-single bird, AIRWORTHY, TRVS FRAC=transverse fracture, INVOLPOWLOS=involuntary power loss)
ALT	Altitude of aircraft (feet AGL)
SPD	Speed of aircraft (knots, V1=decision speed, VR=rotation speed, TAXI)
FLR	Flight Rules
LTCON	Light Conditions
WEATHER	Weather Conditions (NCLD=no clouds, SCLD=some clouds)
CREW	Crew Action (ATO=aborted takeoff, ATB=air turn back, DIV=diversion, ALT=altitude change)
CITYPRS	Scheduled departure-arrival airports
APT	Airport Code of ingestion
LOCALE	Location of airport
US	Y=US (50 states), N=Foreign (non-US), U=Unknown
REGION	Geographic Region
BIRDNAME	Bird species - English name
SPEC	Bird species code (from [4])
#BDS	Number of birds ingested
WT	Bird weight (ounces)
ALERT	Crew Alerted to Presence of Birds
SEE	Number of Bird(s) Seen (SE=2 to 10, FL=11 or more, Y=number unknown)
POWLOSS	Power loss (100%, 50%, SURGE, STALLS, INVOLUNTARY, Y=yes)
VIBE	Engine vibration (maximum units, INC=increased, HIGH=high)
IFSD	In-flight engine shutdown reasons (SURGE, HI EGT=high exhaust gas temperature, SMELL=bird smell, VIBES=engine vibration, NOT BIRD=IFSD not due to bird, Y=no reason given for IFSD)

In columns A through Q, "Y"=occurrence, "blank"=non-occurrence. Columns A through O represent specific categories of engine damage as defined in table 5.1.

A	LEADEDGE	Fan blade leading edge distortion
B	BEDE<=3	1 to 3 bent or dented fan blades
C	TORN<=3	1 to 3 torn fan blades
D	SHINGLED	Shingled (twisted) fan blades
E	ACPAFNAB	Acoustic panel or fan rub strip damaged
F	NACELLE	Engine enclosure dented or punctured
G	BEDE>3	More than 3 fan blades bent or dented
H	TORN>3	More than 3 fan blades torn
I	BROKEN	Pieces missing from fan blade leading edge or tip
J	TRVSFRAC	Fan blade broken chordwise, piece liberated
K	RELEASED	Blade retention mechanism failed
L	FLANGE	Flange separations
M	CORE	Compressor blades/vanes damaged or airflow blocked
N	TURBINE	Turbine damaged
O	SPINNER	Spinner/cap damaged
P	Other engine damage (see REMARKS)	
Q	Engine damage of unknown type (see REMARKS)	

NMS	Classification of engine damge (0=no damage, 1=minor damage, 2=significant damage, S=surge with no damage, L=damage within limits, X=damage unrelated to bird ingestion)
F	Engine failure indicated by *
REMARKS	The Remarks often contain more specific descriptions of engine damage as well as other pertinent information

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DATE	EVT	A/C	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	FLR	LTCON	WEATHER	CREW	CITYPRS	APT	LOCALE	US	REGION	BIRDNAME
01/17/89	166	B747	JT9D	7Q	2			N						N	SIN-OSA	XFO	SINGAPORE OR OSAKA	N	PACIFIC	
01/24/89	1	B757	RB211	535C	1	17:42	TR	MESB	0	VR	VFR	DUSK	CLEAR	ATB	CDG-LHR	CDG	PARIS-CDG,FRANCE	N	EUROPE	COMMON LAPWING
01/24/89	1	B757	RB211	535C	2	17:42	TR	MESB	0	VR	VFR	DUSK	CLEAR	ATB	CDG-LHR	CDG	PARIS-CDG,FRANCE	N	EUROPE	COMMON LAPWING
01/29/89	2	B757	RB211	535E4	1			N						N		XFO	GENOA,ITALY?	N		
01/30/89	3	B757	RB211	535E4	2	16:13	LD	N	100	140	VFR	LIGHT	CLEAR	N	-PMI	PMI	PALMA,MALLORCA,SPAIN	N	EUROPE	"GULL"-MEDIUM
02/17/89	15	B747	JT9D	7R4G2	2			N						N	-NRT	XXX	TOKYO-NRT,JAPAN?	U		
02/23/89	176	B757	2000	2037	2		CL	N						N	MCO-MSP	MCO	ORLANDO,FLORIDA	Y	N.AMERICA	
02/25/89	111	B757	RB211	535C	1			N						N	-LHR	XFO	LONDON-LHR??	N		
03/11/89	19	DC10	JT9D	59A	1	22:00	LR	N	0					N	HND-FUK	FUK	FUKUOKA,JAPAN	N	PACIFIC	
03/11/89	165	B747	JT9D	7Q	3			N						N	AMS-VIE	XFO	AMSTERDAM OR VIENNA	N	EUROPE	
03/12/89	16	B747	JT9D	70A	3	21:30	CL	AIRWORTHY				DARK		N	NRT-ANC	NRT	TOKYO-NRT,JAPAN	N	PACIFIC	COMMON ROCK DOVE
03/13/89	17	A310	4000	4152	1		AP	SEMB						N	VIE-VIE	VIE	VIENNA,AUSTRIA	N	EUROPE	BLACK-HEADED GULL
03/17/89	4	B757	RB211	535C	2			N						N		XFO	LONDON-LHR??	N		
03/17/89	179	A310	4000	4152	1			N						N		TLS	TOULOUSE,FRANCE	N	EUROPE	
03/18/89	18	B767	4000	4060	1	23:06	CL	N	200	150	IFR	DARK	RAIN/SNOW	ATB	MUC-FAD	MUC	MUNICH,GERMANY	N	EUROPE	COMMON LAPWING
03/18/89	28	B767	4000	4060	1		TR	N	0					ATB	MUC-ATH	MUC	MUNICH,GERMANY	N	EUROPE	
03/22/89	20	DC10	JT9D	59A	3			N							FUK-HND	XFO	FUKUOKA OR TOKYO-HND,JAPAN	N	PACIFIC	
03/31/89	167	B747	JT9D	7Q	2	6:20	AP	N					CLEAR	N	SIN-ADL	ADL	ADELAIDE,AUSTRALIA	N	AUS.NEW Z.	SILVER (RED-BILLED) GULL
04/01/89	5	B757	RB211	535E4	1	16:00	TO	N	150	135			DRY	N	LHR-MAN	LHR	LONDON-LHR,ENGLAND,UK	N	EUROPE	"MEDIUM WHITE"
04/01/89	6	B757	RB211	535E4	2			N						N	AGP-AMS	XFO	MALAGA OR AMSTERDAM	N	EUROPE	
04/04/89	21	B757	2000	2037	2		TR	N	0	150				N	MEM-MSP	MEM	MEMPHIS,TENN.	Y	N.AMERICA	AMERICAN ROBIN
04/12/89	22	B747	JT9D	7R4G2	1	20:19	TR	N	0	130		DARK	CLEAR	ATO	WDH-ABJ	WDH	WINDHOEK,NAMIBIA	N	AFRICA	
04/15/89	23	B767	JT9D	7R4D	2			N							SFO-SFO	SFO	SAN FRANCISCO,CAL.	Y	N.AMERICA	BLACK-CROWNED NITE HE
04/17/89	26	B747	JT9D	7Q	4			N						N	SEL-NRT	XFO	SEOUL,KOREA OR TOKYO-NRT	N		
04/18/89	24	B767	JT9D	7R4D	1			MESB						N	FUK-HND	XFO	FUKUOKA OR TOKYO-HND,JAPAN	N	PACIFIC	LITTLE BROWN BAT
04/18/89	24	B767	JT9D	7R4D	2			MESB						N	FUK-HND	XFO	FUKUOKA OR TOKYO-HND,JAPAN	N	PACIFIC	LITTLE BROWN BAT
04/19/89	25	B747	JT9D	7Q	3			N						N	YVR-NRT	XFO	VANCOUVER OR TOKYO-NRT	N		COMMON ROCK DOVE
04/20/89	7	B757	RB211	535E4	2		TR	N	0				RAIN	DIV	HAM-LPA	HAM	HAMBURG,GERMANY	N	EUROPE	"GULL"
04/23/89	30	B747	JT9D	7Q	2			N						N	-NRT	XFO	TOKYO-NRT??	N	PACIFIC	
04/30/89	27	A310	JT9D	7R4E1	2	10:45	AP	N					CLEAR	N	-BRU	BRU	BRUSSELS,BELGIUM	N	EUROPE	COMMON ROCK DOVE
05/02/89	168	B747	JT9D	7R4G2	2			SEMB						N	SIN-	XXX		U		
05/04/89	31	B767	JT9D	7R4D	2	16:18	TR	SEMB	0	100		LIGHT	CLEAR	N	HND-	HND	TOKYO-HND,JAPAN	N	PACIFIC	GRAY-HEADED LAPWING
05/10/89	32	A300	JT9D	59A	1	19:00	TR	SEMB,POWER LOSS	0	VR		LIGHT	CLEAR	ATB	BCN-MAD	BCN	BARCELONA,SPAIN	N	EUROPE	HERRING GULL
05/14/89	33	A300	JT9D	7R4H1	1		TR	N	0	V1		LIGHT		N	KRT-JED	KRT	KHARTOUM,SUDAN	N	AFRICA	RING-NECKED DOVE
05/17/89	8	B757	RB211	535E4	1	10:30	AP	N	1000	135				N	AMS-PMI	PMI	PALMA,MALLORCA,SPAIN	N	EUROPE	COMMON SAND MARTIN
05/24/89	9	B757	RB211	535C	2	6:48	LR	N	0					N	ESB-IST	IST	ISTANBUL,TURKEY	N	MID.EAST	"GULL"
05/28/89	10	B757	RB211	535C	1			N						N	FCO-LHR	XFO	ROME OR LONDON-LHR	N	EUROPE	
06/02/89	169	B747	JT9D	7R4G2	1		TR	N	0	100				ATO	BOM-SIN	BOM	BOMBAY,INDIA	N	ASIA	
06/03/89	34	A310	4000	4152	1		TR	N	0	100	VFR	LIGHT	CLEAR	ATO	PEN-SIN	PEN	PENANG,MALAYSIA	N	PACIFIC	"FISH EAGLE
06/07/89	35	B767	JT9D	7R4D	2			N				LIGHT		N	SPK-NGO	XFO	SAPPORO OR NAGOYA,JAPAN	N	PACIFIC	
06/09/89	36	B767	JT9D	7R4D	1	11:58	AP	N	1000			LIGHT	SCATTERED	N	NGO-SPK	SPK	SAPPORO,JAPAN	N	PACIFIC	FORK-TAILED SWIFT
06/10/89	42	A320	V2500	A1	1		AP	N						N	-ZRH	ZRH	ZURICH,SWITZERLAND	N	EUROPE	
06/13/89	11	B757	RB211	535E4	1	14:40	TR	N	0	120		LIGHT	DRY	ATO	VCE-LGW	VCE	VENICE,ITALY	N	EUROPE	"SEAGULL"-MEDIUM
06/14/89	12	B757	RB211	535C	1		LD	N						N	CFN-LGW	LGW	LONDON-GATWICK,ENGLAND,UK	N	EUROPE	
06/18/89	37	A320	V2500	A1	1	11:25		N						N	BEG-LJU	BEG	BELGRADE,YUGOSLAVIA	N	EUROPE	EURASIAN KESTREL
06/18/89	39	B747	JT9D	7R4G2	3		CL	AIRWORTHY						ALT	SPK-HND	SPK	SAPPORO,JAPAN	N	PACIFIC	BLACK KITE
06/18/89	40	B747	JT9D	7Q	3		AP	N			IFR	LIGHT		N	LAX-ANC	ANC	ANCHORAGE,ALASKA	Y	N.AMERICA	
06/24/89	44	DC10	JT9D	59A	1	21:00	LR	N	0			DARK	CLEAR	N	OSA-OKA	OKA	OKINAWA,JAPAN	N	PACIFIC	"SMALL BIRDS"
07/01/89	69	B767	CF6	80C2	2		LR	N	0					N	-TOY	TOY	TOYAMA,JAPAN	N	PACIFIC	
07/02/89	13	B757	RB211	535E4	2	1:32	TR	N	0		IFR	DARK	DRY	N	TLV-FCO	TLV	TEL AVIV,ISRAEL	N	MID.EAST	
07/02/89	41	B767	JT9D	7R4D	2		LR	N	0					N	FUK-OKA	FUK	FUKUOKA,JAPAN	N	PACIFIC	COMMON ROCK DOVE
07/02/89	170	A310	4000	4152	1		TO	N	15					N	PEN-SIN	PEN	PENANG,MALAYSIA	N	PACIFIC	"1 LARGE BIRD"
07/04/89	38	A320	V2500	A1	2	9:57	AP	N	20	130			SCLD	N	DEL-BOM	BOM	BOMBAY,INDIA	N	ASIA	"EAGLE" OR "KITE"
07/05/89	217	A300	JT9D	59A	1		LD	N	10					N	CGK-MES	MES	MEDAN,INDONESIA	N	PACIFIC	
07/06/89	177	B757	2000	2037	2		TR	N	0					N		XUS		Y	N.AMERICA	
07/09/89	595	A320	CFM56	5	1	16:15	TR	N	0	V1-		DAY		N	BSL-	BSL	BASEL/MULHOUSE,SWITZERLAND	N	EUROPE	
07/12/89	14	B757	RB211	535C	2	8:57	LR	N	0	120	VFR	LIGHT	DRY	N	LHR-GVA	GVA	GENEVA,SWITZERLAND	N	EUROPE	GREATER KESTREL
07/12/89	43	A320	V2500	A1	2	19:20	RV	N	0	040				N	LJU-TIV	TIV	TIVAT,YUGOSLAVIA	N	EUROPE	HERRING GULL
07/14/89	49	A320	CFM56	5	1			N						N	-MEL	XFO	MELBOURNE,AUSTRALIA?	N		
07/14/89	70	B767	CF6	80C2	2			N						N		XFO	JAPAN	N	PACIFIC	
07/14/89	613	A310	CF6	80A	1	11:00	DA	N	3000	180				N	-ORY	ORY	PARIS-ORLY,FRANCE	N	EUROPE	
07/15/89	45	B747	JT9D	7R4G2	2		LD	N						N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	
07/15/89	55	B767	CF6	80A	1		AP	N						N	-NGO	NGO	NAGOYA,JAPAN	N	PACIFIC	
07/17/89	46	A320	V2500	A1	1	17:45	LD	N						N	BEG-LJU	LJU	LJUBLJANA,YUGOSLAVIA	N	EUROPE	EURASIAN KESTREL
07/17/89	596	A320	CFM56	5	2	10:05	TR	N	0	120		DAY		N	BIA-	BIA	BASTIA,CORSICA,FRANCE	N	EUROPE	EURASIAN KESTREL
07/18/89	71	B767	CF6	80C2	1		AP	N						ATB	-MAO	MAO	MANUS,BRAZIL	N	S.AMERICA	
07/18/89	597	A320	CFM56	5	1	6:34	TR	N	0	130				N	ORY-	ORY	PARIS-ORLY,FRANCE	N	EUROPE	EURASIAN KESTREL
07/19/89	72	B767	CF6	80C2	2		TR	SEMB	0					N	HIJ-TYO	HIJ	HIROSHIMA,JAPAN	N	PACIFIC	
07/20/89	175	A310	4000	4152	1			N						N		XFO	SINGAPORE?	N		
07/21/89	50	A320	CFM56	5	1		LD	N						N	-DUS	DUS	DUSSELDORF,GERMANY	N	EUROPE	COMMON SWIFT
07/24/89	29	B757	RB211	535E4	2			N						N	IVT-DUS	XFO	DUSSELDORF OR MADAGASCAR	N		EURASIAN KESTREL
07/24/89	117	B747	JT9D	7R4G2	1		AP	N						N	NRT-SVO	SVO	MOSCOW-SHEREMETYE,RUSSIA	N	EUROPE	
07/25/89	140	A320	V2500	A1	1	7:12	TR	SEMB	0	135				ATB	TLS-TLS	TLS	TOULOUSE,FRANCE	N	EUROPE	
07/28/89	178	B767	JT9D	7R4D	1		RV	N	0					N	-TLV	TLV	TEL AVIV,ISRAEL	N	MID.EAST	
07/30/89	614	B767	CF6	80A	1		TR	N	0	V1-				N		XFO		N		
08/02/89	118	A320	V2500	A1	1	16:10	CL	N	3500	250			SCLD	ATB	DEL-BLR	DEL	DELHI,INDIA	N	ASIA	INDIAN WHT-BCKD VULTUR
08/02/89	120	B757	2000	2037	2			N						N	DTW-	XUS	DETROIT,MICHIGAN??	Y	N.AMERICA	AMERICAN KESTREL
08/02/89	598	A320	CFM56	5	2			N						N		XFO		N		
08/03/89	51	A320	CFM56	5	1			N						N	-LHR	XFO	LONDON,ENGLAND?	N		
08/03/89	121	B767	4000	4060	1		TR	N	0	085				DIV	GRQ-DUS	GRQ	GRONINGEN,NETHERLANDS	N	EUROPE	RED-LEGGED PARTRIDGE
08/03/89	599	A320	CFM56	5	1		LR	N	0					N	-MRS	MRS	MARSEILLE,FRANCE	N	EUROPE	BARN SWALLOW
08/05/89	122	DC10	JT9D	59A	3	14:16	TR	N	0			LIGHT	CLEAR	N	PEK-OSA	PEK	BEIJING,CHINA	N	ASIA	GRAY-HEADED LAPWING
08/06/89	123	B767	4000	4060	2	13:09	AP	N	300	145			NCLD	N	MBA-MUC	MUC	MUNICH,GERMANY	N	EUROPE	BLACK-HEADED GULL
08/06/89	124	B747	JT9D	7Q	4		CL	N	1800					N	DEL-FLO	DEL	DELHI,INDIA	N	ASIA	
08/06/89	615	A310	CF6	80A	2		TR	N	0	135				ATO	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	
08/07/89	47	B757	RB211	535C	1			N						N	LHR-BFS	XFO	LONDON-LHR OR BELFAST	N	EUROPE	
08/07/89	125	DC10	JT9D	59A	1	19:00		N						N	NRT-BKK	XFO	TOKYO-NRT OR BANGKOK	N	PACIFIC	FORK-TAILED SWIFT

IRDNAME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	VIBE	IFSD	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	NMS	F	REMARKS	EVT
		1		N	N	N		N																		0			166
OMMON LAPWING	P14a1	1	8	N	N	N	N	N																		0		BIRD MATTER ON NOSE COWL,OUTSIDE OF FAN	1
OMMON LAPWING	P14a1	1	8	N	N		4.7	N	Y	Y		Y		Y												1		#2 ENG VIBR DUE TO CLAPPER LOCKUP	1
		1			N	N	N	N	Y	Y																1		DMG BLD FOUND ON GRD INSP AT BAH	2
ULL"-MEDIUM		1			SE	N	N	N																		0		BLOOD ON BLD TIPS FOUND ON GROUND INSP	3
						N		N																		0		HPC BSCOPED. NO DMG FOUND	15
				N	FL	STALLS		N																		S		TAILPIPE FLAMES.THROTLE REDUC.POST CLIMB	176
		1				N	N	N													Y					2		1 IPC BL BE/DE	111
		1				N				Y																1		1 FB BENT AT TIP	19
		1		N	N	N		N																		0			165
OMMON ROCK DOVE	Q3a1	1	14			N	INC	N					Y	Y			Y									2		10 PR FB REPLCD,127 COWL RIVETS FRACTRD	16
ACK-HEADED GULL	P5a35	3	10		Y	N		N																		0		TRAINING FLIGHT	17
						N	N	N																		0			4
		1		N	N	N		N																		0		VIBES EXISTED PRIOR TO BIRDSTRIKE	179
OMMON LAPWING	P14a1	1	7.7			SURGE		N													Y					S		SURGE,FLAMES.LTU SUD INTL.ENG REMVD.	18
		1				N		N																		0		LTU SUD INTL	28
						N															Y					X		C6 LE BL DENTS-HARD OBJ,NOT BIRD INGSTN	20
LVER (RED-BILLED) GULL	P5a32	1	11	N	SE	N		N																		0		2 OTHER A/C STRIKES	167
EDIUM WHITE"		1		N	FL	N	N	N	Y																	1		1 FB LE DEFLECTION	5
		1			N	N	N	N																		0		BLOOD STAINS UPPER OUTER SIDE OF INTAKE	6
MERICAN ROBIN	Z21a325	1	2.5		Y			N		Y			Y				Y							Y		2		FAN CASE STRUT DMG.THUD.1FB BROKEN.	21
		1		N		SURGE		SURGE																		S		LOUD BANG(SURGE).MANY TIRES DEFLATED.	22
ACK-CROWNED NITE HERON	I1b2	1	24												Y											2		TRNG FLT.5 FB BE.	23
		1				N		N																		0		BLOOD ON INLET LIP	26
TTLE BROWN BAT	BAT	1	0.5		N	N		N													Y					X		UNRELATED MINOR HARD OBJ HPC DMG.ENG REM	24
TTLE BROWN BAT	BAT	1	0.5		N	N		N																		0		WHEN,WHERE UNKNOWN	24
OMMON ROCK DOVE	Q3a1	1	14			N		N																		0		MAINT. FOUND BIRD REMAINS IN INLET	25
ULL"				N	FL	N	1.9	N		Y			Y													1		DIV TO MUC AT END OF CLIMB	7
		1			N	N		N																		0		BLOOD FOUND IN TOKYO PRE-DEPART CHECK	30
OMMON ROCK DOVE	Q3a1		14			N		N																		0		BIRD RMNS.ON FB'S	27
		>1		N	N	N		N																		0		SQ FLT #44? SPINNER HIT	168
RAY-HEADED LAPWING	P14a12	3	10		FL	N		N																		0		SMALL WHITE BIRDS-TBI	31
ERRING GULL	P5a24	3	36		Y	100%,NR SURGE		HI EGT		Y											Y		Y			2	*	EPR=0,HPC BL/VANE CLASH,HARD OBJ.DMG	32
NG-NECKED DOVE	Q3a62	1	5		N	N		N		Y																1		2 FB BE.2 PR FB REPLACED	33
OMMON SAND MARTIN	Z15b31	1	0.5	N		N	N	N																		0		STRIKE ON OUTSIDE OF COWL	8
ULL"		1				N	N	N						Y										Y		1		NACELLE LINING DMG AFT OF FAN	9
						N	N	N																Y		1		1 FB CLAPPER DMGED	10
		1		N	N	SURGE		N																		S		SURGE	169
ISH EAGLE		1			Y	SURGE		N																		S		SURGE,NO BIRD REMAINS	34
		1			N	N		N																		0		BD.REMNS.FD ON GRD AT NAGOYA-SPINNR.FEGV	35
RK-TAILED SWIFT	U3b70	1	1.5		Y	N		N																		0		FOUND ON WALKAROUND	36
		1			FL	N		N																		0		INLET COWL HIT.NO INGESTION EVIDENCE	42
EAGULL"-MEDIUM		1			1	N	4.0	N		Y		Y	Y													1		2 FB SHNGLD,TIP DMG.ATO DUE TO VIBES	11
						N	N	N						Y							Y					2		1 IPC BL BE/DE	12
JRASIAN KESTREL	J5b12	1	7			N	N	N																		0		BDSTRIKE EVIDENCE FOUND ON WALKAROUND	37
ACK KITE	J4a31	1	32					N	Y						Y											2		12 FB BE.PLANNED ALT WAS CHANGED.	39
						N		N																		0		BIRD RMNS IN GUIDE VANES	40
MALL BIRDS"		1			FL	N		N																		0		FLOCK OF SMALL BIRDS	44
		1				N		N													Y					2		3 HPC BLDS TIP CORNERS MISSING.SERVCABLE	69
		1		N		N	N	N																		0		FLT CONTINUED NORMALLY.UNVALDTD 8oz WT	13
OMMON ROCK DOVE	Q3a1		14			N		N																		0		BRD REMNS FAN EXIT GUIDE VANES	41
LARGE BIRD"		1		N	N	N		N					Y												Y	1		1 FB DMGD. HPC BLS MINOR NICKS	170
AGLE" OR "KITE"		1			1	N		N	Y	Y			Y													1		2FB,FAN CASE PANEL.PASSNGR SAW 6LB EAGLE	38
		1						N			Y			Y			Y									2		1FB PC MISSING,3FB TORN.COWL HOLE	217
		1		N	N	N	INC	N		Y																1		1-2 FB BE	177
		1				N		N																		0		BORESCOPED-NO DAMAGE	595
REATER KESTREL	J5b18	1	9.6	N	1	N	N	N													Y					2		4 IPC BL BENT.HI IDLE=38% FAN SPEED	14
ERRING GULL	P5a24	1	32		Y	N		N																		0		A/C AT FULL THRUST REVERSE,"1/2 BIRD"	43
		1				N	N	N																		0		PREFLIGHT INSP.	49
		1				N		N																		0		GROUND INSP.	70
		1				N		N																		0		BORESCOPED.	613
		1				N		N																		0			45
		1						N		Y																1		2 FB BENT	55
JRASIAN KESTREL	J5b12	1	8			N		N					Y													1		DMG FN CASE PANEL CONTINUE IN SERVICE	46
JRASIAN KESTREL	J5b12	1	7		SE	N		N																		0			596
		1			Y	N	5.0	N				Y														1		ATB ON SUCCEEDING FLIGHT	71
JRASIAN KESTREL	J5b12	1	7			N		N																		0		-V1.BORESCOPED-NO DAMAGE.	597
		2				N		N	Y			Y	Y		Y						Y					2		2HPC STG 1 BLDS,6 FB DMGD. ENG REMOVED	72
		1		N	N	N		N					Y													1		RUBSTRIP BROKEN	175
OMMON SWIFT	U3b68	1	1			N		N																		0		FRESH BIRD STAINS AFTER LANDING	50
JRASIAN KESTREL	J5b12	1	7.2			N	N	N																		0		GROUND INSP.	29
		1						N																		0		AGB HOUSING NOT CRACKED.NO ENG DMG.	117
		2		N	Y	N		SMELL					Y													1		1SMALL&1LARGE BIRD,NOSE PANEL CRACK.TRNG	140
		1		N		N		N													Y					X		3 HPC BLADES HARD OBJECT NICKS.NOT BIRD.	178
		1				N		N																		0			614
DIAN WHT-BCKD VULTURE	J4a48	1	192		SE		INC	N					Y	Y	Y										Y	2		6 FB BE.VOL.PWR RED-VIBES.COWL DMG.	118
MERICAN KESTREL	J5b11	1	[illegible]		N	N		N	Y	Y																1		1 FB LE DENT INBD SHROUD	120
		1				N		N																		0			598
		1				N		N																		0		GROUND INSP. LHR	51
D-LEGGED PARTRIDGE	M5b16	1	16			N		N																		0		2D STRK THIS ENG-3/18/89.SPINNER HIT.	121
RN SWALLOW	Z15b39	1	0.75			N		N																		0			599
RAY-HEADED LAPWING	P14a12	1	10			N		N																		0		SPINNER HIT	122
ACK-HEADED GULL	P5a35	1	10	N	SE	N		N																		0		HIT NOSE COWL, ING INTO CORE	123
		1			N	N	4.0 AVM	N	Y					Y			Y								Y	2		5FB DMGD,4FB REPAIRD.LOUD THUD.COWL DENT	124
		1			1	N	INC	N							Y											2		6FB BE.SAW BIRD JUST BEFORE V1.BANG.	615
		1		N	N	N	N	N													Y					L		20 STG1 IPC BL SLITE TIP CURL WITN LIMIT	47
RK-TAILED SWIFT	U3b70	1	1.5		N	N		N																		0		BIRD INTO CORE	125

DATE	EVT	A/C	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	FLR	LTCON	WEATHER	CREW	CITYPRS	APT	LOCALE	US	REGION	BIRDNAME
08/08/89	73	B767	CF6	80C2	2			N						N	-TYO	XFO	TOKYO-TYO,JAPAN?	N		
08/09/89	126	B747	JT9D	7Q	4			N						N	-NRT	XFO	TOKYO-NRT,JAPAN??	N		COMMON SKYLARK
08/10/89	127	B767	JT9D	7R4D	2			N						N	YYZ-YVZ	XFO	TORONTO/DEER LAKE,CANADA	N	N.AMERICA	
08/11/89	52	A320	CFM56	5	2		AP	N				LIGHT	CLEAR	N	-DUS	DUS	DUSSELDORF,GERMANY	N	EUROPE	COMMON WOOD PIGEON
08/13/89	56	B767	CF6	80A	1	16:56	TR	N	0	128		LIGHT	CLOUDS	ATO	LGW-	LGW	LONDON-GATWICK,ENGLAND,UK	N	EUROPE	
08/13/89	74	A310	CF6	80C2	2	9:05	TR	SEMB	0				OVERCAST	ATB	PIK-BHX	PIK	PRESTWICK,SCOTLAND,UK	N	EUROPE	HERRING GULL
08/14/89	75	B767	CF6	80C2	1	11:26	CL	TRANSVERSE FRAC.	200	150				ATB	GRU-	GRU	SAO PAULO,BRAZIL	N	S.AMERICA	BLACK VULTURE
08/15/89	130	B747	JT9D	7Q	4			N						N		XXX		U		BLACK-HEADED GULL
08/16/89	57	B767	CF6	80A	1			N						N	-OSA	XFO	OSAKA,JAPAN?	N		
08/16/89	129	DC10	JT9D	59A	3	11:55	AP	N						N	HND-SPK	SPK	SAPPORO,JAPAN	N	PACIFIC	BLACK KITE
08/18/89	76	A310	CF6	80C2	1		CL	N						N	MBA-	MBA	MOMBASA,KENYA	N	AFRICA	
08/18/89	128	B747	JT9D	7R4G2	2	12:00	TR	N	0	V1-		LIGHT	CLEAR	ATO	ORD-NRT	ORD	CHICAGO,ILLINOIS	Y	N.AMERICA	"GULL"
08/18/89	131	B757	2000	2037	1			N						N	CAN-SHA	XFO	GUANGZHOU/SHANGHAI,CHINA	N	ASIA	
08/20/89	174	B757	2000	2037	1			N						N		XUS		Y	N.AMERICA	
08/21/89	58	B767	CF6	80A	1		LR	N	0					N	-OSA	OSA	OSAKA,JAPAN	N	PACIFIC	
08/21/89	173	B767	JT9D	7R4D	2			N						N		XUS		Y	N.AMERICA	
08/22/89	600	A320	CFM56	5	1	18:13	LR	N	0	120				N	-LYS	LYS	LYON,FRANCE	N	EUROPE	EURASIAN KESTREL
08/25/89	77	A310	CF6	80C2	2			N						N	-YEG	XFO	EDMONTON,CANADA?	N		
08/28/89	78	B767	CF6	80C2	2			N						N	-LAX	XUS	LOS ANGELES,CA?	Y	N.AMERICA	
08/28/89	79	B767	CF6	80C2	1		LR	N	0					N	-KUH	KUH	KUSHIRO,INDIA	N	ASIA	
08/29/89	132	B767	JT9D	7R4D	1		TR	N	0					N	NRT-	NRT	TOKYO-NRT,JAPAN	N	PACIFIC	
08/30/89	53	A320	CFM56	5	1	5:40	TR	N	0	VR		LIGHT	RAIN	ATB	BRU-LHR	BRU	BRUSSELS,BELGIUM	N	EUROPE	CARRION CROW
08/31/89	59	B767	CF6	80A	2			N						N	-OSA	XFO	OSAKA,JAPAN?	N		
08/31/89	133	B757	2000	2037	2			N						N	CAN-SHA	XFO	GUANGZHOU/SHANGHAI,CHINA	N	ASIA	
08/31/89	142	B767	JT9D	7R4D	2	20:00	AP	N						N	NGO-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	BLACK-CROWNED NITE H
08/31/89	171	B747	4000	4056	3		LR	MEMB	0					N	PAE-PAE	PAE	EVERETT,WASHINGTON	Y	N.AMERICA	"SMALL BIRDS"
08/31/89	171	B747	4000	4056	4		LR	MEMB	0					N	PAE-PAE	PAE	EVERETT,WASHINGTON	Y	N.AMERICA	"SMALL BIRDS"
08/31/89	172	A300	JT9D	59A	1		TC	N						ATB	CGK-MES	CGK	JAKARTA-SOEKARNO,INDONESIA	N	PACIFIC	
09/01/89	134	B747	JT9D	7Q	3	8:56	AP	N	500	145			NCLD	N	BAH-BKK	BKK	BANGKOK,THAILAND	N	PACIFIC	"SMALL"
09/05/89	60	B767	CF6	80A	1		AP	N						N	-SDJ	SDJ	SENDAI,JAPAN	N	PACIFIC	
09/05/89	141	A320	V2500	A1	1		TR	N	0	145				N	DEL-HYD	DEL	DELHI,INDIA	N	ASIA	"LARGE KITE"4-5 KG
09/05/89	601	A320	CFM56	5	2			N						N		XFO		N		
09/06/89	135	B757	2000	2037	1			N						N	CAN-SHA	XFO	GUANGZHOU/SHANGHAI,CHINA	N	ASIA	
09/07/89	136	B747	4000	4056	3		LR	N	0			LIGHT		N	PAE-PAE	PAE	EVERETT,WASHINGTON	Y	N.AMERICA	COMMON NIGHTHAWK
09/09/89	61	B767	CF6	80A	2		LD	N						N	-TOY	TOY	TOYAMA,JAPAN	N	PACIFIC	"BAT"
09/10/89	62	A310	CF6	80A	1	15:10	TR	N	0	V1	VFR	LIGHT	OVERCAST	N	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	
09/10/89	137	B747	JT9D	7R4G2	2			N						N	LHR-ANC	XXX	LONDON-LHR OR ANCHORAGE	U		HORNED LARK
09/11/89	80	A310	CF6	80C2	2			N						N	-DEL	XFO	DELHI,INDIA?	N		
09/11/89	634	B767	CF6	80C2	1		LR	N	0					N	-HIJ	HIJ	HIROSHIMA,JAPAN	N	PACIFIC	
09/12/89	63	A310	CF6	80A	1			N						N	-AMS	XFO	AMSTERDAM, NETHERLANDS?	N		
09/12/89	138	B747	JT9D	7Q	1		TR	MEMB,TRANSV.FRAC	0	170				ATB	LAX-OSA	LAX	LOS ANGELES,CAL.	Y	N.AMERICA	COMMON ROCK DOVE
09/12/89	138	B747	JT9D	7Q	2		TR	MEMB,TRANSV.FRAC	0	170				ATB	LAX-OSA	LAX	LOS ANGELES,CAL.	Y	N.AMERICA	COMMON ROCK DOVE
09/13/89	139	B747	JT9D	7R4G2	3			N						N	MNL-BKK	XFO	MANILA OR BANGKOK	N	PACIFIC	SCHRENDK'S BITTERN
09/13/89	554	A320	V2500	A1	1	7:35	RV	N	0	080			SCLD	N	-AMD	AMD	AHMEDABAD,INDIA	N	ASIA	"KITE"-MEDIUM
09/15/89	54	A320	CFM56	5	2		TR	N	0	V1+				N	FRA-CDG	FRA	FRANKFURT,GERMANY	N	EUROPE	
09/17/89	48	B757	RB211	535C	1	9:33	TR	N	0	140	VFR	LIGHT	DRY	ATB	BFS-LHR	BFS	BELFAST,N.IRELAND,UK	N	EUROPE	COMMON LAPWING
09/17/89	81	B767	CF6	80C2	1		TR	N	0					N	MYJ-TYO	MYJ	MATSUYAMA,JAPAN	N	PACIFIC	
09/19/89	65	B767	CF6	80A	1			N						N	-SHI	XFO	SHIMOJISHIMA,JAPAN?	N		
09/20/89	82	A310	CF6	80C2	1		TR	N	0	120				N	BJL-DKR	BJL	BANJUL,GAMBIA	N	AFRICA	
09/22/89	143	DC10	JT9D	59A	3		CL	N	100			LIGHT		N		XFO		N		"LARGE SNOWY HERON"
09/23/89	144	A300	4000	4158	1	18:09	TO	N	20	132			NCLD	N	PUS-SEL	PUS	PUSAN,KOREA	N	ASIA	"EGRET"-MEDIUM
09/23/89	234	A310	4000	4152	2	9:23		N								XFO		N		
09/24/89	66	B767	CF6	80A	1		DA	N						N	-OKA	OKA	OKINAWA,JAPAN	N	PACIFIC	
09/25/89	145	B767	JT9D	7R4D	2			N						N	FUK-HND	FUK	FUKUOKA,JAPAN	N	PACIFIC	
09/27/89	67	B767	CF6	80A	2			N						N	-OSA	XFO	OSAKA,JAPAN?	N		
09/27/89	146	B747	4000	4056	4			N						N		XXX		U		
09/28/89	68	B767	CF6	80A	2		TR	N	0	130	VFR	DARK	CLEAR	ATO	JFK-	JFK	NEW YORK-JFK,NY	Y	N.AMERICA	HERRING GULL
09/28/89	83	B747	CF6	80C2	2			N						N	-RIO	XFO	RIOGRANDE,BRAZIL?	N		BLACK-CROWNED NITE H
09/29/89	147	B747	JT9D	7Q	1			N						N	YVR-SEL	XFO	VANCOUVER OR SEOUL	N		
09/29/89	602	A320	CFM56	5	1	8:50	CL	N	100	160		DAY		N	BIQ-	BIQ	BIARRITZ,FRANCE	N	EUROPE	"FINCH"
09/30/89	616	B767	CF6	80A	2		TR	N	0	125				N	KCZ-	KCZ	KOCHI,JAPAN	N	PACIFIC	
10/01/89	88	B767	CF6	80A	2		LR	N	0					N	-KCZ	KCZ	KOCHI,JAPAN	N	PACIFIC	
10/01/89	98	B747	CF6	80C2	3		LR	N	0		VFR			N	AMS-JFK	JFK	NEW YORK-JFK,NY	Y	N.AMERICA	RING-NECKED PHEASANT
10/01/89	148	B747	4000	4056	3			N						N		XFO		N		COMMON BARN OWL
10/04/89	151	B767	4000	4060	1			SEMB						N		XXX		U		
10/04/89	603	A320	CFM56	5	1	14:56	LR	N	0	110				N	-LYS	LYS	LYON,FRANCE	N	EUROPE	EURASIAN KESTREL
10/06/89	149	B757	2000	2040	2		AP	N						N	ALB-PIE	PIE	ST.PETERSBURGH,FLA.	Y	N.AMERICA	
10/07/89	112	B757	RB211	535C	1	11:22	LD	MESB	832	135	VFR	LIGHT	DRY	N	LHR-BSL	BSL	BASEL/MULHOUSE,SWITZERLAND	N	EUROPE	"PIGEON"-MEDIUM
10/07/89	112	B757	RB211	535C	2	11:22	LD	MESB	832	135	VFR	LIGHT	DRY	N	LHR-BSL	BSL	BASEL/MULHOUSE,SWITZERLAND	N	EUROPE	"PIGEON"-MEDIUM
10/07/89	150	B767	4000	4060	1			SEMB						N	CPH-CAI	XFO	COPENHAGEN OR CAIRO	N		SENEGAL COUCAL
10/09/89	604	A320	CFM56	5	2			N						N	-NTE	XFO	NANTES,FRANCE??	N		
10/10/89	113	B757	RB211	535E4	2		LD	N						N	-KTM	KTM	KATHMANDU,NEPAL	N	ASIA	
10/12/89	99	B767	CF6	80C2	2			N						N	-OSA	XFO	OSAKA,JAPAN?	N		
10/12/89	152	B767	JT9D	7R4D	1		TR	MEMB,POWER LOSS	0	125				ATO	TLV-CDG	TLV	TEL AVIV,ISRAEL	N	MID.EAST	CHUKAR
10/12/89	152	B767	JT9D	7R4D	2		TR	MEMB,POWER LOSS	0	125				ATO	TLV-CDG	TLV	TEL AVIV,ISRAEL	N	MID.EAST	CHUKAR
10/15/89	605	A320	CFM56	5	2			N						N		XFO		N		
10/16/89	100	B767	CF6	80C2	1		LR	N	0					N	-OSA	OSA	OSAKA,JAPAN	N	PACIFIC	
10/16/89	101	A310	CF6	80C2	1		AP	N				OVERCA	RAIN	N	-IST	IST	ISTANBUL,TURKEY	N	MID.EAST	"SMALL BLACK"
10/16/89	114	B757	RB211	535E4	2	8:03	LD	N	600	120	VFR	LIGHT	DRY	N	DCA-ORD	ORD	CHICAGO,ILLINOIS	Y	N.AMERICA	RING-BILLED GULL
10/16/89	153	B747	JT9D	7R4G2	2			N						N	FUK-HND	XFO	FUKUOKA OR TOKYO-HND,JAPAN	N	PACIFIC	BLACK-TAILED GULL
10/18/89	154	B747	JT9D	7R4G2	2			U						N	CTS-HND	XFO	SAPPORO OR TOKYO-HND,JAPAN	N	PACIFIC	
10/19/89	155	B767	4000	4060	1		LR	SEMB	0			LIGHT		N	-HER	HER	HERAKLION,GREECE	N	EUROPE	HORNED LARK
10/21/89	84	A320	CFM56	5	1		LR	N	0					N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	
10/21/89	102	B747	CF6	80C2	3	15:56	CL	MESB	50	170		CLOUDS	RAIN	N	HAM-	HAM	HAMBURG,GERMANY	N	EUROPE	"MEDIUM"
10/21/89	102	B747	CF6	80C2	4	15:56	CL	MESB	50	170		CLOUDS	RAIN	N	HAM-	HAM	HAMBURG,GERMANY	N	EUROPE	"MEDIUM"
10/22/89	89	B767	CF6	80A	1			N						N	-DUS	XFO	DUSSELDORF,GERMANY?	N		
10/23/89	103	A310	CF6	80C2	1	21:00	TR	SEMB,TRANSV.FRAC	0	147		DARK	2100	ATO	AMM-	AMM	AMMAN,JORDAN	N	MID.EAST	EURASIAN STONE-CURL

BIRDNAME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	VIBE	IFSD	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	NMS	F	REMARKS	EVT
		1		N		N		N																		0		BSI OK	73
COMMON SKYLARK	Z14a81	1	2	N	N	N		N																		0		FEATHERS AT STGS 3 & 7.5 BLEED SCREEN	126
		1		N	N	N		N		Y																1		1 FB BOWED 1/4"	127
COMMON WOOD PIGEON	Q3a9	1	18					N																		0		FEATHERS SENT TO AIR FRANCE	52
		1			1		5.0	N	Y			Y	Y													2		5FB,3AC.LINERS DMGD.DARK BIRD	56
HERRING GULL	P5a24	2	40		1		INC	N				Y	Y				Y				Y					2		18 FB DMGD,HPC BL DMG SERVICEABLE	74
BLACK VULTURE	J1a1	1	48	N	1	50%	5.0	VIBES				Y		Y				Y								2	*	1 FB FAILED 3 IN ABOVE MIDSPAN SHROUD	75
BLACK-HEADED GULL	P5a35	1	10	N	N	N		N																		0		BIRD,RMNS IN LPC. ENG DISASSEMBLED	130
		1				N		N																		0		GROUND INSP.	57
BLACK KITE	J4a31	1	32	N	N	N		N																		0		FINAL AP. BIRD RMNS ON FEGV	129
		1		N			HIGH	VIBES	Y															Y		1		3 FB LE,1 OGV DELAMINATED	76
"GULL"		1			SE	N		N																		0		FEATHER ON FEGV	128
		1		N	N	N		N																		0		TO BE SCOPED.CORE DMG?	131
		1		N	N	N		N		Y																1		1 FB BE.FLT # NW 1191	174
		1				N		N													Y					L		HPC STG 1 BLDS DMGD SERVICEABLE LIMITS	58
				N	N	N		N																		0		BIRD HIT NOSE COWL	173
EURASIAN KESTREL	J5b12	1	7		1	N		N																		0		BORESCOPED-NO DAMAGE.	600
		1		N	N	N		N		Y																1		1 BE FB.GROUND INSP.	77
		1		N	N	N		N																		0		GROUND INSP.	78
		1			Y			N																		0			79
				N	N	N		N																		0			132
CARRION CROW	Z51a31	1	19			N	9.6	N	Y			Y	Y				Y				Y					2		22FB DMGD.COMP DMG SERVICEABLE	53
		1				N		N																		0		GROUND INSP.	59
		1		N		N		N		Y															Y	L		2 FB BENT WITHIN LIMITS	133
BLACK-CROWNED NITE HERON	I1b2	1	24	N	N	N		N													Y					1		C9 TIP NICK BLENDED OUT.	142
"SMALL BIRDS"		>1		N	N	N		N																		0		TRAINING FLIGHT	171
"SMALL BIRDS"		>1		N	N	N		N																		0		HIT ON SPINNER	171
		1		N	N	SURGE		N									Y									2		1 BL BROKEN.BANG(SURGE),THEN POWER LOSS	172
"SMALL"		1		N	1	N		N					Y				Y									2		2FB PIECES MISSING.3FB DMG.COWL HIT.	134
		1		N		N		N					Y											Y		1		10 OGV OUTER FAIRINGS,3.AC LINRS REPLCD	60
"LARGE KITE"4-5 KG		1		N	Y	N	INC	N		Y			Y	Y												1		3FB BE.FAN CASE FAIRING HOLE.CORE ING.	141
		1				N		N																		0		BORESCOPED-NO DAMAGE	601
		1		N	N	N		N																		0		SAME A/C AS 133 & 131.	135
COMMON NIGHTHAWK	T4a5	1	2.5	N	N	N		N																		0		BOEING OWNED.TO BE DELVD KE.SPINNER HIT.	136
"BAT"		1				N		N													Y					2		6 BLS DMGD IN STG 5&6 COMPRESSOR	61
		1				N		N		Y																1		2 BE FB 15 MM FROM TIP	62
HORNED LARK	Z14a83	1	1.5	N	N	N		N																		0		ANC=ANCHORAGE, ALASKA.BIRD INTO CORE.	137
		1				N		N																		0		GROUND INSP.	80
		1				N		N																		0			634
		1				N		N		Y																1		1 FB TIP CURL	63
COMMON ROCK DOVE	Q3a1	4	14	N	Y	SURGE		N					Y	Y	Y		Y									2		INLET COWL PEN. BY FB PIECE.5FB DMG.	138
COMMON ROCK DOVE	Q3a1	5	14	N	Y	INVLNTRY.NRSTALL	INC	SURGE,HIEGT					Y		Y			Y								2	*	NONRECOV STALL,TAIL CONE LIBRTED,7BL DMG	138
SCHRENDK'S BITTERN	I1d6	1	3	N	N	N		N																		0			139
"KITE"-MEDIUM		1		N	1	N		N	Y				Y													1		3FB LE WITHIN LIMITS,AC PNL DMG.	554
		1				N	3.3	N																	Y	1		2FB DMG,RPL.VIB:3.3CLIMB,2CRUISE,1.2IDLE	54
COMMON LAPWING	P14a1	1	8	N	SE	N	2.2	N	Y				Y		Y	Y	Y									2		5 FB BE/DE,14 TORN,3 BROKEN,ENG.CHANGED	48
		1			Y	N		N																		0			81
		1				N		N													Y					2		1 STG 1 HPC BL TIP MISSG,5 STG6 BL TEARS	65
		1				N		N																		0		SM-MED BIRD INTO CORE	82
"LARGE SNOWY HERON"		1		N	Y	N		N	Y						Y											2		5 BL BE LE. FLT #968	143
"EGRET"-MEDIUM		1		Y	1	N		N		Y																1		3 FB BE.	144
		1				N			Y																	1		2 FB LE TIP CURL.RPLCD.	234
		1		N		N		N																		0		DESCENT/APPROACH	66
		1		N	N	N		N																		0		POF UNKNOWN	145
		1				N		N													Y					2		4 HPC STG 7 BLS BEYOND LIMITS.ENG RMVD.	67
		1		N	N	N		N	Y																	1		1 FB LE CURL	146
HERRING GULL	P5a24	1	40	N	1	N		N					Y								Y					2		BROKEN STG 1 HPC BLDS.ENG REMOVED	68
BLACK-CROWNED NITE HERON	I1b2	1	24		N			N				Y									Y					2		1 STG 1 COMP BL DMGD.2 SHGL FB.ENG RMVD	83
		1		N	N	N		N	Y																	1		2 FB LE DEF.	147
"FINCH"		1			FL	N		N																		0			602
		1				N		N																		0			616
		1				N		N																	Y	2		6 FB DMGD & RPLCD.	88
RING-NECKED PHEASANT	M5b141	1	40			N		N	-Y																	1		3 FB LE DEFORMED	98
COMMON BARN OWL	K1a2	1	11	N	N	N		N		Y																1		2 FB PRS RPLCD.WALKAROUND.	148
		>1		N	N	N		N																		0		SEVERAL BDS HIT COWL	151
EURASIAN KESTREL	J5b12	1	7			N		N																		0		BORESCOPED-NO DAMAGE	603
		1			Y	N		N													Y					X		1 STG 6 HPC BL BEYOND LIMITS. HARD OBJ	149
"PIGEON"-MEDIUM		1		N	SE	N	0.9	N																		0		FAN SPD 73%.MANY STRIKES A/C.ENGINES	112
"PIGEON"-MEDIUM		1		N	SE	N	0.9	N																		0		FAN SPD 74%.MANY STRIKES A/C,ENGINES	112
SENEGAL COUCAL	S2f24	>1	7	N	N	N		N																		0		BIRD ID IMPLIES CAIRO??	150
		1				N		N																		0		BORESCOPED	604
		1				N		N																		0			113
		1			N	N		N													Y					2		HPC S1 LE TIP DMG,S8 UNK DMG.NO FB DMG.	99
CHUKAR	M5b12	>1	18	N	FL	SURGE		N																		S		SURGE.BIRDS IN COMP.INVESTIGATED.	152
CHUKAR	M5b12	>1	18	N	FL	NON-RECOV.SURGE		N		Y																2	*	1 FB BE. NON-RECOV.SURGE. INVESTIGATED.	152
		1				N		N																		0		BORESCOPED	605
		1			N	N		N																		0		NO CORE INGESTION	100
"SMALL BLACK"		1			1	N		N				Y														1		2 FB SHINGLD AT PART SPAN SHRDS.	101
RING-BILLED GULL	P5a14	1	17	N	Y	N		N																		0			114
BLACK-TAILED GULL	P5a11	1	21	N	N	N		N		Y																1		2 FB BE	153
		>=1		N	N	N		N																		0		POSS MULT BIRD	154
HORNED LARK	Z14a83	>1	2	N	FL	N		N																		0		CORE ING.	155
		1			Y	N		N																Y		1		T25 SENSOR REPLACED DUE TO BIRD DEBRIS	84
"MEDIUM"		1		N	SE	N		N	Y		Y						Y									2		2 FB LE DISTOR, 1 FB LE CRACK	102
"MEDIUM"		1		N	SE	N		N	Y																	1		4 FB LE DISTORTION	102
		1			N	N		N																	Y	1		2 FB DMGD	89
EURASIAN STONE-CURLEW	P9a1	2	16	N	N	50% "STALL"	10.0	N						Y	Y	Y	Y	Y								2	*	POSSIBLE HARD FOD. 2 FB SEPARATED	103

DATE	EVT	A/C	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	FLR	LTCON	WEATHER	CREW	CITYPRS	APT	LOCALE	US	REGION	BIRDNAME
10/24/89	90	B767	CF6	80A	1		LR	N	0					N	TYO-KCZ	KCZ	KOCHI,JAPAN	N	PACIFIC	
10/24/89	606	A320	CFM56	5	2			N						N		XFO		N		
10/25/89	91	B767	CF6	80A	1		AP	N						N	-OKJ	OKJ	OKAYAMA,JAPAN	N	PACIFIC	
10/26/89	104	B767	CF6	80C2	1			N						N	-MRU	XFO	MAURITIUS,MAURITIUS?	N		COMMON BARN OWL
10/27/89	164	B767	4000	4060	1			N						N		XFO		N		
10/28/89	92	A310	CF6	80A	1		TC	N		V1+				N	CDG-LIN	CDG	PARIS-CDG,FRANCE	N	EUROPE	COMMON STARLING
10/29/89	156	B747	JT9D	7R4G2	1		AP	N						N	-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	
10/29/89	157	A310	4000	4152	1		TO	N						N	HAM-JFK	HAM	HAMBURG,GERMANY	N	EUROPE	
11/02/89	119	B767	JT9D	7R4D	1		AP	N	150			DARK	SCATTERED	N	HKG-KIJ	KIJ	NIGATA,JAPAN	N	PACIFIC	SPOT-BILLED DUCK
11/02/89	158	B767	JT9D	7R4D	1		AP	SEMB						N	TLV-ETH	ETH	ELAT,ISRAEL	N	MID.EAST	COMMON ROCK DOVE
11/04/89	93	B767	CF6	80A	2		DA	N						N	-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	
11/05/89	607	A320	CFM56	5	2	10:15	DA	N				DAY		N	-NCE	NCE	NICE,FRANCE	N	EUROPE	COMMON SKYLARK
11/07/89	105	A310	CF6	80C2	2		LR	N	0					N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	"SMALL BIRD"
11/08/89	106	A310	CF6	80C2	2			N						N	-BOM	XFO	BOMBAY,INDIA?	N		
11/11/89	94	B767	CF6	80A	1			N						N	-OSA	XFO	OSAKA,JAPAN?	N		
11/11/89	159	B747	JT9D	7R4G2	3		TR	U	0	145		LIGHT	CLEAR	ATB	IST-SIN	IST	ISTANBUL,TURKEY	N	MID.EAST	BLACK-HEADED GULL
11/14/89	608	A320	CFM56	5	1		LR	N	0					N	-LIL	LIL	LILLE,FRANCE	N	EUROPE	
11/15/89	95	A310	CF6	80A	1		CL	N	50	VR+	VFR		FOG	ATB	AMS-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	
11/15/89	160	B767	4000	4060				N						N	EWR-ARN	XXX	NEWARK OR STOCKHOLM	U		
11/15/89	609	A320	CFM56	5	1		LR	N	0					N	-LIL	LIL	LILLE,FRANCE	N	EUROPE	
11/16/89	107	A310	CF6	80C2	2	7:00	CL	N	17000		VFR	BRIGHT	CLEAR	N	TRV-BOM	TRV	TRIVANDRUM,INDIA	N	ASIA	
11/18/89	115	B757	RB211	535C	2	15:25	LR	SEMB	0	121		LIGHT	RAIN	N	LHR-BFS	BFS	BELFAST,N.IRELAND,UK	N	EUROPE	COMMON LAPWING
11/20/89	161	B767	JT9D	7R4D	2		AP	N						N	-LAX	LAX	LOS ANGELES,CAL.	Y	N.AMERICA	SHORT-EARED OWL
11/21/89	85	A320	CFM56	5	1	16:00	LR	MESB	0					N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	HUNGARIAN PARTRIDGE
11/21/89	85	A320	CFM56	5	2		LR	MESB	0					N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	HUNGARIAN PARTRIDGE
11/25/89	162	A300	JT9D	7R4H1	1		TC	N						N	KWI-CAI	XFO	KUWAIT OR CAIRO	N	MID.EAST	BLACK KITE
11/26/89	108	A300	CF6	80C2	1		TR	N	0					ATB	KHI-	KHI	KARACHI,PAKISTAN	N	ASIA	
11/29/89	617	A310	CF6	80A	1			N						N	-AMS	XFO	AMSTERDAM,NETHERLANDS??	N		
12/03/89	96	B767	CF6	80A	1			N						N	-BHX	XFO	BAHIA BLANCA,ARGENTINA?	N		
12/04/89	245	B747	JT9D	7R4G	1	18:04	RV	N	0	125				N	OSA-SIN	SIN	SINGAPORE	N	PACIFIC	"VERY LARGE SEAGULL"
12/06/89	163	A300	JT9D	7R4H1	1	12:00	TR	N	0	VR		LIGHT	CLEAR	N	-JED	JED	JEDDAH,SAUDI ARABIA	N	MID.EAST	COMMON ROCK DOVE
12/13/89	86	A320	CFM56	5	2			N						N	-SAN	XUS	SAN DIEGO,CAL.??	Y	N.AMERICA	
12/14/89	97	A310	CF6	80A	1	19:00	LR	MEMB	0				CLEAR	N	ANK-IST	IST	ISTANBUL,TURKEY	N	MID.EAST	BLACK-HEADED GULL
12/14/89	97	A310	CF6	80A	2	19:00	LR	MEMB	0				CLEAR	N	ANK-IST	IST	ISTANBUL,TURKEY	N	MID.EAST	BLACK-HEADED GULL
12/15/89	221	B747	JT9D	7Q	1	1:12		N						N	TPE-BKK	XFO	TAIWAN OR THAILAND	N	PACIFIC	
12/19/89	216	A310	JT9D	7R4	2	16:30	TR	N	0					ATB	BRU-	BRU	BRUSSELS,BELGIUM	N	EUROPE	COMMON LAPWING
12/19/89	220	A300	JT9D	7R4H	1	7:30	RV	N	0					N	MED-JED	JED	JEDDAH,SAUDI ARABIA	N	MID.EAST	
12/20/89	109	B767	CF6	80C2	2	11:40	LD	N						N	-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	
12/22/89	610	A320	CFM56	5	2			N						N		XFO		N		
12/23/89	110	A310	CF6	80C2	2			N						N	-MBA	XFO	MOMBASA,KENYA?	N		
12/26/89	611	A320	CFM56	5	1		DA	N	1000	160		NIGHT		N	-FNI	FNI	NIMES,FRANCE	N	EUROPE	
12/28/89	116	B757	RB211	535C	2	16:40	TO	SEMB	800	150	VFR	LIGHT	SCLD	DIV	BFS-LHR	BFS	BELFAST,N.IRELAND,UK	N	EUROPE	COMMON LAPWING
12/31/89	87	A320	CFM56	5	1	8:00	LR	N	0		VFR	DAWN	CLEAR	N	-LYS	LYS	LYON,FRANCE	N	EUROPE	
01/01/90	215	B767	4000	4056	2	22:35	TR	N	0	080			SCATTERED	ATO	HRE-LGW	HRE	HARARE,ZIMBABWE	N	AFRICA	AFRICAN EAGLE OWL
01/01/90	218	A310	4000	4158				N						N		XFO	KOREA OR INDONESIA	N		LESSER GOLDEN PLOVER
01/02/90	191	B747	CF6	80C2	2		LR	N	0					N	-HKG	HKG	HONG KONG	N	ASIA	
01/09/90	192	A310	CF6	80C2	1		LD	N						N	-LCA	LCA	LARNACA,CYPRUS	N	MID.EAST	"GULL" 18 oz.
01/14/90	184	B767	CF6	80A	1	12:00	LR	SEMB	0				OVERCAST	N	-LTN	LTN	LONDON-LUTON,ENGLAND,UK	N	EUROPE	HUNGARIAN PARTRIDGE
01/15/90	219	B767	JT9D	7R4	1	19:33	AP	SEMB	300	145				N	HND-SPK	SPK	SAPPORO,JAPAN	N	PACIFIC	COMMON POCHARD
01/16/90	193	A310	CF6	80C2	1			MESB						N	-DLA	XFO	DOUALA,CAMEROON ???	N		
01/16/90	193	A310	CF6	80C2	2			MESB						N	-DLA	XFO	DOUALA,CAMEROON ???	N		
01/18/90	194	A310	CF6	80C2	2		LD	N						N	-SXF	SXF	E.BERLIN,GERMANY	N	EUROPE	"CROW"?
01/24/90	195	B767	CF6	80C2	1		LR	N	0					N	-IGU	IGU	IGUASSA FALLS,BRAZIL	N	S.AMERICA	
01/28/90	185	A310	CF6	80A	2	19:30	CL	N				DUSK	FOG	ATB	ANK-	ANK	ANKARA,TURKEY	N	MID.EAST	
01/28/90	196	A300	CF6	80C2	2			N						N	BKK-CNX	XFO	THAILAND	N	PACIFIC	
01/29/90	197	B767	CF6	80C2	2			N						N	-YYZ	XFO	TORONTO,CANADA ??	N		
01/30/90	180	A320	CFM56	5	2		CL	N					CLEAR	ATB	CDG-	CDG	PARIS-CDG,FRANCE	N	EUROPE	COMMON STARLING
02/02/90	186	B767	CF6	80A	1			N						N	-MYJ	XFO	MATSUYAMA,JAPAN ??	N		
02/08/90	222	B767	JT9D	7R4D	2	5:45		N						N	TLV-CDG	XFO	TEL AVIV OR PARIS-CDG	N		
02/09/90	244	A310	JT9D	7R4E	1	9:20		MESB						N	SIN-CMB	XFO	SINGAPORE/COLOMBO,SRILANKA	N		
02/09/90	244	A310	JT9D	7R4E	2	9:20		MESB						N	SIN-CMB	XFO	SINGAPORE/COLUMBO,SRILANKA	N		
02/10/90	198	B747	CF6	80C2	1		LR	N	0					N	-JKT	JKT	JAKARTA,INDONESIA	N	PACIFIC	
02/11/90	187	B767	CF6	80A	2			N						N	-JFK	XUS	NEW YORK-JFK,NY ???	Y	N.AMERICA	
02/11/90	226	B747	4000	4056	2			SEMB						N	LAX-SYD	XXX	LOS ANGELES/SYDNEY,AUSTRLA	U		
02/11/90	243	A310	JT9D	7R4E	2	14:50	AP	N	1340	130				N	KTM-CCU	CCU	CALCUTTA,INDIA	N	ASIA	"BIG HAWK"
02/12/90	199	B767	CF6	80C2	2			N						N	-OSA	XFO	OSAKA,JAPAN ???	N		
02/12/90	224	DC10	JT9D	59A	3	17:30		N						N	NRT-BKK	XFO	TOKYO-NRT OR BANGKOK	N	PACIFIC	COMMON SNIPE
02/13/90	181	A320	CFM56	5	1		AP	N	200	140				N	-BRE	BRE	BREMEN,GERMANY	N	EUROPE	
02/13/90	227	A310	JT9D	7R4E	2			N							-BRU	XFO	BRUSSELS,BELGIUM??	N		MALLARD DUCK
02/14/90	182	A320	CFM56	5	1		LR	N	0					N	-TLS	TLS	TOULOUSE,FRANCE	N	EUROPE	BLACK-HEADED GULL
02/14/90	251	A300	JT9D	59A	1		TR	N	0					N	DPS-	DPS	DENPASAR,BALI	N	PACIFIC	
02/18/90	200	B747	CF6	80C2	4		LR	N	0					N	-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	
02/19/90	188	B767	CF6	80A	1			N						N	-GIG	XFO	RIO DE JANEIRO,BRAZIL?	N		BLACK VULTURE
02/21/90	201	B767	CF6	80C2	1	15:00	TR	MESB	0	V1+	VFR		CLEAR	ATB	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	COMMON LAPWING
02/21/90	201	B767	CF6	80C2	2	15:00	TR	MESB	0	V1+	VFR		CLEAR	ATB	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	COMMON LAPWING
02/21/90	202	B767	CF6	80C2	2		LR	N	0	090			RAIN	N	-SHJ	SHJ	SHARJAH,UA EMIRATES	N	MID.EAST	"GULL-MEDIUM"
02/21/90	225	B767	JT9D	7R4D	1	12:46	AP	MEMB	800					N	OSA-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	GREATER SCAUP
02/21/90	225	B767	JT9D	7R4D	2	12:46	AP	MEMB	800					N	OSA-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	GREATER SCAUP
02/23/90	491	B767	4000	4056	1			N						N	-DUS	XFO	DUESSELDORF,GERMANY??	N		
02/24/90	223	A300	JT9D	7R4H	1	6:22	TR	N	0	160				ATB	NBO-JED	NBO	NAIROBI,KENYA	N	AFRICA	HELMETED GUINEA FOWL
02/27/90	206	A310	CF6	80C2	2		TR	N	0	V1+				ATB	SXF-	SXF	E.BERLIN,GERMANY	N	EUROPE	HUNGARIAN PARTRIDGE
03/02/90	228	B757	2000	2037	2			N						N	ATL-MSY	XUS	ATLANTA OR NEW ORLEANS	Y	N.AMERICA	
03/04/90	203	B767	CF6	80C2	2			N						N	-AXT	XFO	AKITA,JAPAN ???	N		
03/05/90	183	A320	CFM56	5	2	9:30	TR	N	0	120		OVRCST	WET	N	LST-MEL	LST	LAUNCESTON,AUSTRALIA	N	AUS.NEW Z.	MASKED PLOVER
03/05/90	189	B767	CF6	80A	1			N						N	-OKJ	XFO	OKAYAMA,JAPAN ??	N		
03/07/90	204	B747	CF6	80C2	3	7:00	LR	N	0			DAWN	CLOUDY	N	JFK-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	RING-NECKED PHEASANT
03/09/90	229	B767	4000	4056	1	12:10	LR	N	0	070				N	HRE-NBO	NBO	NAIROBI,KENYA	N	AFRICA	BLACK KITE

ME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	VIBE	IFSD	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	NMS	F	REMARKS	EVT
:		1				N		N				Y														1		2 FB SHINGLED	90
		1				N		N																		0		SAME ENGINE AS #605	606
		1				N		N																		0			91
N BARN OWL	K1a2	1	11		N	N		N																		0			104
		1		N	N	N		N																		0		BD RMNS IN CORE	164
N STARLING	Z53a82	1	3		FL	N	N	N																		1		3 FB UNK DMG. ODOR AT 1000 FT AGL.	92
		1		N	N	N		N																		0			156
		1		N	N	N		N																		0		MULT BIRD? ING. INTO CORE.HIT FLOCK?	157
LLED DUCK	L2e34	1	44	N	N	N		N													Y					2		5TH STG LE TIPS CLASHED TE IGV'S.ENG RMD	119
N ROCK DOVE	Q3a1	2	14	N	Y	N		N																		0		INVSTGTD	158
		1				N		N				Y													Y	2		5FB SHNGLD,12 FB BEYOND LIMITS, RPLCD.	93
N SKYLARK	Z14a81	1	1.3			N		N																		0		BORESCOPED	607
BIRD*		1			1	N	N	N																		0		BSI ON #18 #2 RNGS. NO TRACES IN #1	105
		1			N	N		N	Y																	1		4 FB NON-SERVICABLE LE DMG	106
		1			N	N	N	N																		0		GROUND INSP.	94
HEADED GULL	P5a35	>=1	10	N	FL		HIGH	N	Y			Y	Y		Y											2		POSS MULT BD, AIRWTHY 9FB DMG,3 RPLCD.	159
		1				N		N																		0		BORESCOPED	608
		1				N		N				Y													Y	1		3FB UNK DMG,2FB SHNGLED,3 FB SETS RPLCD	95
		1		N	N	N		N	Y	Y																1		1 BL DMGD	160
		1				N		N																		0		BORESCOPED	609
		1			N	N	2.6	N																	Y	1		3 FB IMPACT DMG.VIBE=1.4 UNITS AT CRUISE	107
N LAPWING	P14a1	4	8	N	FL	N	1.4	N													Y					2		8 IPC BL BE.13 BDS HIT A/C.INVST.ENG RPL	115
EARED OWL	K2c7	1	12.7	N	N	N		N																		0			161
IAN PARTRIDGE	M5b59	1	14		FL	N		N																		0		SAME ENG AS #84.LARGE FLOCK SEEN.	85
IAN PARTRIDGE	M5b59	1	14		FL	N		N																		0		LARGE FLOCK SEEN.	85
ITE	J4a31	1	28	N	N	N		N																	Y	1		3 FB DMGD	162
		1			N	N	INC	N																	Y	2		4 FB UNK DMG,RPLCD. INC N1 VIBES	108
		1				N		N						Y										Y		1		FAN FRAME STRUT COVER BROKEN.	617
		1			N	N	N	N	Y																	1		2 FB LE DEFORM OUTBD MIDSPAN SHROUD	96
ARGE SEAGULL*		1			1	N		N																		0		REVERSER LOCKED OUT FOR UNKNOWN REASON	245
N ROCK DOVE	Q3a1	1	14	N	N	SURGE		N		Y							Y									2		2 FB SEVERE DMG.TOUCH & GO(VR)	163
		1			N	N		N																		0			86
HEADED GULL	P5a35	6-17	10		FL	N		N				Y												Y		1		20 FB SHNGLD,1FB BLENDABLE.	97
HEADED GULL	P5a35	6-17	10		FL	N		N																		0		IMMED.AFTER TOUCHDOWN.>100 BIRDS HIT A/C	97
		1				N		N																		0		EVIDENCE FOUND IN INLET ON GROUND	221
N LAPWING	P14a1	1	7.7			N		N					Y	Y	Y		Y									2		INV.4FB BE,2FB BKN.14FB DMG.ALL FB RPLCD	216
		1				N																				0		POWER AT REVERSE IDLE	220
		1		N	N	N	N	N				Y		Y	Y						Y			Y		2		7 FB DMGD, HPC S1 COMP BLS TORN,DENTED	109
		1				N		N																		0			610
		1			N	N		N	Y																	L		SLIGHT FB LE DISTORT. WITHIN LIMITS	110
		1			SE	N		N																		0			611
N LAPWING	P14a1	3	8	N	N	N	4.6	N				Y	Y		Y						Y					2		4FB,15IPC BL BE/DE.E1 STRUCK ALSO.	116
		1			Y	N		N	Y	Y	Y															1		2 FB LE, 8MM CRACK	87
EAGLE OWL	2S44	1	26	Y	1	SURGE																				S		BANG,SMELL,FLAMES,SURGE.VOL POWER RED.	215
GOLDEN PLOVER	5N26	1	5		N																					0		FOUND DURING OVERHAUL.INTO CORE.	218
		1			N	N	5.0	N	Y																	1		1 FB LE DISTORTION	191
8 oz.		1			N	N	N	N																		1		DENT ON INLET COWL LIP GRD INSP	192
IAN PARTRIDGE	4L85	2	14		N	N	N	N	Y	Y			Y													1		3 FB RPLCD.LE DENT,TIP CURL.CREW UNAWARE	184
N POCHARD	2J115	2	35									Y	Y		Y		Y				Y					2		4FB DMG,1LE PIECE MISSING.PRIOR CORE DMG	219
		1			N	N		N																		0		PREFLITE IHSP AT DLA	193
		1			N	N		N																		0		PREFLITE INSP AT DLA	193
?		1			N	N	N	N																		0		STAIN ON SPINNER, BOOSTER INLET.	194
		1			N	N	N	N																		0		ING.INTO BOOSTER AREA	195
		1			N	N	3.5	N	Y			Y														1		2 FB LE DISTORT	185
		1			N	N	N	N																		0			196
		1			N	N		N																		0		GRD. INSP.	197
N STARLING	21Z75	1	3		N	N		N	Y															Y	Y	2		8 OGV FAIRNGS BKN,4FB LE DIST,5PRFB RPLD	180
		1			N	N		N																		0		EVIDENCE FOUND GRD.INSP.	186
		1				N		N		Y																1		2 FB BE	222
						N																				0		WALK AROUND.ZULU TIME.	244
						N																				0		WALK AROUND.ZULU TIME.	244
		1			N	N		N																		0			198
		1			N	N		N																	Y	1		1 FB RPLCD	187
		>1				N				Y																1		3 FB DMGD	226
VK*		1			1	N																				0			243
		1			N	N	N	N																		0		GRD. INSP.	199
N SNIPE	6N47	1	5			N		N																		0		GRD INSP.C1 STATOR HIT	224
	TBI	1			N	N	N	N																		0		ODOR ON PREVIOUS FLIGHT	181
D DUCK	2J84	1	40			N																				0		BIRD INTO CORE.WALKAROUND.	227
EADED GULL	14N36	1	10			N		N																		0			182
		1				N				Y																1		3 FB BE	251
		1			N	N	4.1	N																	Y	2		11 DMG FB.	200
ULTURE	1K4	1	48		N	N		N													Y					2		12 HPC STG 1 BL DMGD.ENG RPLCD.	188
N LAPWING	5N1	1	7.7		N	N		N		Y																1		3 FB TIP CURL	201
N LAPWING	5N1	1	7.7		N	N	3.2	N		Y																1		1 FB TIP CURL.ATB DUE TO VIBES(3.2)	201
EDIUM*		1		N		N		N																		0			202
R SCAUP	2J124	>1	40		FL										Y											2		BENT 5-8 BLADES	225
R SCAUP	2J124	1	40		FL	N																				0			225
		1				N		N																		0		BIRD INTO CORE	491
ED GUINEA FOWL	5L3	1	52	N	SE	SURGE	2.0	N		Y			Y	Y			Y							Y		2		SMELL,BANG.3FB LE TIP BRKN,FEGV BRKN.VR	223
IAN PARTRIDGE	4L85	1	14		N	N	2.8	N		Y	Y															1		1FB TORN,1FB DISTORT.JUST AFTER ROTATION	206
		1		N	N	N		N		Y							Y									2		3 FB DMG, 1 LE TIP BRK OUT	228
		1			N	N		N						Y							Y			Y		1		3STG1 HPC BL SHIFTED-SERVICBLE.COWL DENT	203
PLOVER	5N24	1	11		SE	N	9.9	N	Y	Y		Y	Y			Y	Y									2		20 FB DMG.ENG RMVD.3FB LE TIP FRAGMENTED	183
		1			N	N		N																		0		FD.GROUND INSP.	189
CKED PHEASANT	4L161	1	32		N	N		N	Y																	1		3 FB LE DISTORT-RPLCD	204
ITE	3K28	1	28		Y	N		N		Y																1		SPINNER HIT.1FB BE.BIRD INTO CORE-SMELL	229

DATE	EVT	A/C	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	FLR	LTCON	WEATHER	CREW	CITYPRS	APT	LOCALE	US	REGION	BIRDNAME
03/16/90	230	A300	JT9D	7R4H1	1			N						N	RUH-JED	XFO	RIYADH OR JEDDAH,S.ARABIA	N	MID.EAST	
03/16/90	231	A300	JT9D	7R4H	2		CL	N		144			CLEAR	N	DHA-RUH	DHA	DHAHRAN,SAUDI ARABIA	N	MID.EAST	HERRING GULL
03/17/90	207	B757	RB211	535C	1			N						N	LHR-MAN	XFO	LONDON-LHR/MANCHESTER,ENG.	N	EUROPE	"SMALL"
03/24/90	190	B767	CF6	80A	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN ???	N		
03/24/90	232	B747	JT9D	7Q	3		TR	N	0					N	BUE-RIO	BUE	BUENOS AIRES,ARGENTINA	N	S.AMERICA	
03/26/90	205	A310	CF6	80C2	2			N						N	-FRA	XFO	FRANKFURT,GERMANY ??	N		
04/02/90	276	A310	CF6	80A	2		AP	N						N	-SHJ	SHJ	SHARJAH,UA EMIRATES	N	MID.EAST	
04/04/90	233	B767	JT9D	7R4D	1	18:25	AP	N	300				RAIN	N	HND-SPK	SPK	SAPPORO,JAPAN	N	PACIFIC	
04/06/90	265	A320	CFM56	5	2		TR	N	0	137				N	LIL-LIL	LIL	LILLE,FRANCE	N	EUROPE	COMMON WOOD PIGEON
04/06/90	277	B767	CF6	80A	1			N						N	-ARB	XFO	ARLANDA,SWEDEN??	N		
04/06/90	292	B767	CF6	80C2	2		LD	SEMB	10		VFR		RAIN	N	-WAW	WAW	WARSAW,POLAND	N	EUROPE	BLACK-HEADED GULL
04/09/90	278	A310	CF6	80A	1		LR	N	0					N	-DUS	DUS	DUSSELDORF,GERMANY	N	EUROPE	
04/10/90	335	DC10	JT9D	59A				N						N		XFO		N		BARN SWALLOW
04/11/90	293	B767	CF6	80C2	2			N						N	LAX-YVR	XXX	LOS ANGELES OR VANCOUVER	U	N.AMERICA	
04/12/90	266	A320	CFM56	5	2	15:44	TR	N	0	010			SCLD	N	LHR-DUS	LHR	LONDON-LHR,ENGLAND,UK	N	EUROPE	
04/13/90	235	B757	2000	2037	2		AP	N						N	MSP-DCA	DCA	WASHINGTON-NATIONAL,DC	Y	N.AMERICA	OSPREY
04/16/90	279	B767	CF6	80A	1			N						N	-FUK	XFO	FUKUAKA,JAPAN???	N		
04/16/90	294	B747	CF6	80C2	2		LR	N	0			BRIGHT	CLEAR,DRY	N	YOW-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	RING-NECKED PHEASANT
04/16/90	295	B767	CF6	80C2	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN???	N		
04/16/90	296	B767	CF6	80C2	2			N						N	-TYO	XFO	TOKYO-TYO,JAPAN???	N		
04/17/90	208	B747	RB211	524G	3		LD	N						N	PAE-PAE	PAE	EVERETT,WASHINGTON	Y	N.AMERICA	CANADA GOOSE
04/18/90	297	B767	CF6	80C2	1		TR	N	0	V1+				ATB	ORY-JFK	ORY	PARIS-ORLY,FRANCE	N	EUROPE	COMMON WOOD PIGEON
04/19/90	298	B767	CF6	80C2	1		AP	N	1000					N	YVR-YYZ	YYZ	TORONTO,CANADA	N	N.AMERICA	
04/19/90	299	A310	CF6	80C2	2		TR	N	0	V1+				ATB	AYT-	AYT	ANTALYA,TURKEY	N	MID.EAST	EGYPTIAN VULTURE
04/23/90	280	B767	CF6	80A	2			N						N	-TYO	XFO	TOKYO-TYO,JAPAN???	N		
04/25/90	300	B747	CF6	80C2	4			N						N	HND-FUK	XFO	TOKYO-HND OR FUKUOKA,JAPAN	N	PACIFIC	COMMON SKYLARK
04/26/90	301	B767	CF6	80C2	1			N						N	-MYJ	XFO	MATSUYAMA,JAPAN??	N		
04/26/90	302	A310	CF6	80C2	1			N						N	SXF-PFO	XFO	E.BERLIN OR CYPRUS	N		
04/30/90	236	A310	4000	4152	1		TX	N	0	TAXI				N	BNE-POM	BNE	BRISBANE,AUSTRALIA	N	AUS.NEW Z.	"HAWK"
05/02/90	258	A310	4000	4152	2			N						N	-TPA	XUS	TAMPA,ST. PETE ??	Y	N.AMERICA	
05/02/90	281	B767	CF6	80A	1			N						N	-TOY	XFO	TOYAMA,JAPAN??	N		
05/02/90	303	A310	CF6	80C2	2		LR	N	0					N	-EBB	EBB	ENTEBBE,UGANDA	N	AFRICA	AFRICAN FISH EAGLE
05/03/90	259	B747	4000	4056	3	9:00	CL	N						N	TPE-HKG	TPE	TAIPEI,TAIWAN	N	PACIFIC	
05/03/90	304	A310	CF6	80C2	2	16:56	LR	N	0	132	VFR		CLEAR	N	-LBA	LBA	LEEDS-BRADFORD,ENGLAND,UK	N	EUROPE	"GULL" 24 oz.
05/04/90	267	A320	CFM56	5	1		TR	N	0	V1+				ATB	LIL-	LIL	LILLE,FRANCE	N	EUROPE	"PARTRIDGE" 15OZ.
05/05/90	305	A300	CF6	80C2	1			N						N	-BKK	XFO	BANGKOK,THAILAND??	N		
05/08/90	282	B767	CF6	80A	1		AP	N						N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	PACIFIC	
05/09/90	237	B767	JT9D	7R4D	2	20:00	AP	N						N	NRT-NGO	NGO	NAGOYA,JAPAN	N	PACIFIC	LITTLE BROWN BAT
05/10/90	306	B767	CF6	80C2	1		AP	N						N	-TOY	TOY	TOYAMA,JAPAN	N	PACIFIC	
05/11/90	283	B767	CF6	80A	1			N						N	-OSA	XFO	OSAKA,JAPAN ???	N		
05/12/90	249							N								XFO		N		BLACK KITE
05/13/90	239	B767	4000	4060	1			N						N		XFO		N		GYRFALCON
05/15/90	209	B757	RB211	535E4	2			N						N	TFS-AMS	XFO	TENERIFE OR AMSTERDAM	N	EUROPE	
05/17/90	284	A310	CF6	80A	2			N						N	-STR	XFO	STUTTGART,GERMANY ??	N		
05/18/90	285	A310	CF6	80A	1		LR	N	0					N	LHR-LCA	LCA	LARNACA,CYPRUS	N	MID.EAST	COMMON LAPWING
05/20/90	307	B747	CF6	80C2	4			N						N	-GIG	XFO	RIO DE JANEIRO,BRAZIL??	N		
05/22/90	210	B757	RB211	535E4	1	16:00	LD	N						N	-KEV	KEV	KEVLAVICK,ICELAND	N	EUROPE	"LARGE"
05/23/90	268	A320	CFM56	5	1		TR	SEMB	0	V1+				N	SYD-MEL	SYD	SYDNEY,AUSTRALIA	N	AUS.NEW Z.	
05/26/90	248	B767	JT9D	7R4D	2	11:16	TR	N	0	120			RAIN	N	SHI-	SHI	SHIMOJISHIMA,JAPAN	N	PACIFIC	LITTLE EGRET
05/27/90	211	B757	RB211	535E4	1		CR	N	13000					N		XXX	MEXICO OR TEXAS	U	N.AMERICA	
05/27/90	635	A310	CF6	80C2	1		CL	N						N	CAI-MGQ	CAI	CAIRO,EGYPT	N	AFRICA	
05/29/90	308	B767	CF6	80C2	2			N						N	-NGS	XFO	NAGASAKI,JAPAN??	N		
05/30/90	309	A310	CF6	80C2	1		CL	N						N	MGQ-	MGQ	MISKOLC,HUNGARY	N	EUROPE	
05/31/90	247	A300	JT9D	59A	1	11:16	TR	POWER LOSS	0	VR				ATB	IBZ-	IBZ	IBIZA,SPAIN	N	EUROPE	HERRING GULL
05/31/90	250	B767	JT9D	7R4E	1		CL	N						N	AKL-SYD	AKL	AUCKLAND,NEW ZEALAND	N	AUS.NEW Z.	
06/01/90	238	B767	4000	4056	1	20:00	TR	N	0						LIM-SCL	LIM	LIMA,PERU	N	S.AMERICA	"SMALL SEAGULL"
06/02/90	334	DC10	JT9D	59A	3			SEMB						N	-FUK	XFO	FUKUOKA,JAPAN???	N		RUDDY TURNSTONE
06/03/90	618	B767	CF6	80A	2			N						N	-MYJ	XFO	MATSUYAMA,JAPAN??	N		
06/04/90	310	A300	CF6	80C2	2			N						N	-LTN	XFO	LONDON-LUTON,ENGLAND??	N		
06/07/90	269	A320	CFM56	5	1			N						N	-MSP	XUS	MINNEAPOLIS??	Y	N.AMERICA	
06/07/90	311	B767	CF6	80C2	2		AP	N						N	-KCZ	KCZ	KOCHI,JAPAN	N	PACIFIC	
06/07/90	312	A310	CF6	80C2	1		LR	N	0					N	-LCA	LCA	LARNACA,CYPRUS	N	MID.EAST	CHUKAR
06/08/90	313	B767	CF6	80C2	2			N						N	-OSA	XFO	OSAKA,JAPAN???	N		
06/09/90	212	B757	RB211	535C	2			N						N	-MAN	XFO	MANCHESTER,ENG ???	N		
06/09/90	270	A320	CFM56	5	2	14:20	TR	N	0	140			SCLD	ATO	BSL-LHR	BSL	BASEL/MULHOUSE,SWITZERLAND	N	EUROPE	"PIGEON"-MEDIUM
06/10/90	271	A320	CFM56	5	1		LR	N	0					N	-RMA	RMA	ROMA,AUSTRALIA	N	AUS.NEW Z.	
06/11/90	286	B767	CF6	80A	1			N						N	-TAK	XFO	TAKAMATSU,JAPAN ??	N		
06/12/90	272	A320	CFM56	5	1		TR	N	0	V1+				ATB	LYS-BOD	LYS	LYON,FRANCE	N	EUROPE	COMMON WOOD PIGEON
06/12/90	314	A300	CF6	80C2	1		LD	N	100	140	VFR		OVERCAST	N	PEK-SHA	SHA	SHANGHAI,CHINA	N	ASIA	COMMON ROCK DOVE
06/12/90	434	DC10	JT9D	59A	3	21:00		N						N	-OKA	XFO	OKINAWA,JAPAN??	N		ROSEATE TERN
06/12/90	490	B757	2000	2037	1			N						N		XUS		Y	N.AMERICA	
06/13/90	213	B757	RB211	535E4	1			N						N	MLA-MUC	XFO	MALTA OR MUNICH	N	EUROPE	
06/13/90	287	B767	CF6	80A	1		LR	N	0					N	-SDJ	SDJ	SENDAI,JAPAN	N	PACIFIC	
06/14/90	273	A320	CFM56	5	2			SEMB						N	-MEL	XFO	MELBOURNE,AUSTRALIA??	N		"SMALL"
06/14/90	485	B757	2000	2037	1		LR	N	0	080				N	CAS-RBA	RBA	RABAT,MOROCCO	N	AFRICA	
06/14/90	619	B767	CF6	80A	2		AP	N						N	-KCZ	KCZ	KOCHI,JAPAN	N	PACIFIC	
06/17/90	214	B757	RB211	535E4	1	4:00	LD	MEMB	30	110		DARK	CLEAR	N	-BOS	BOS	BOSTON,MASS.	Y	N.AMERICA	HERRING GULL
06/17/90	214	B757	RB211	535E4	2	4:00	LD	MEMB	30	110		DARK	CLEAR	N	-BOS	BOS	BOSTON,MASS.	Y	N.AMERICA	HERRING GULL
06/19/90	274	A320	CFM56	5	1		TR	N	0	V1+				N	PAU-ORY	PAU	PAUK,BURMA	N	ASIA	
06/19/90	315	A300	CF6	80C2	1	8:30	TR	N	0	V1+			SCLD	N	BOM-DXB	BOM	BOMBAY,INDIA	N	ASIA	BLACK KITE
06/20/90	246	B747	4000	4158	1	6:20	TX	N	0	TAXI				N	SEL-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	
06/20/90	288	B767	CF6	80A	2			N						N	-KMJ	XFO	KUMAMOTO,JAPAN??	N		
06/22/90	289	B767	CF6	80A	2			N						N	-NGS	XFO	NAGASAKI,JAPAN ??	N		
06/25/90	290	B767	CF6	80A	2			N						N	-OSA	XFO	OSAKA,JAPAN ??	N		
06/25/90	620	B767	CF6	80A	2			N						N	-KMI	XFO	MIYAZAKI,JAPAN??	N		
06/26/90	291	B767	CF6	80A	1			N						N	-OSA	XFO	OSAKA,JAPAN ??	N		
06/26/90	636		CF6	80C2				N						N		XFO	HANOVER,GERMANY??	N		

RDNAME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	VIBE	IFSD	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	NMS F	REMARKS	EVT
		1				N								Y												1	DENTED COWL LIP.WALK AROUND.	230
RRING GULL	14N14	1	40	N	1	N	HIGH	N						U			Y									2	INLET COWL: 46 HOLES. 2 FB BRK.OUT	231
ALL"		1			1	N	N	N																		0	BIRD MATTER DOWN BYPASS DUCT	207
		1			N	N		N																		0	FOUND GROUND INSPECTION	190
						N		N					Y				Y									2	AT CRUISE AVM=1.5. 7 FB DMG, 3FB BRKN	232
		1			N	N		N																		0	GRD INSP	205
		1				N		N					Y												Y	2	16 FAN BLADES,6 ACOUSTIC LINERS DMGD.	276
		1			1	N																				0	BD INTO CORE.	233
MMON WOOD PIGEON	2P9	1	18			N	9.9	N																	Y	2	7FB DMG BEYOND LIMITS,14FB REPLACED	265
		1				N		N																		0	EVIDENCE ON HP STATOR VANES.GRD INSP	277
ACK-HEADED GULL	14N36	>1	10		FL	N		N																		0	DEBRIS ON ALL FB.MIDSPAN CORE ING	292
		1				N		N																		0		278
N SWALLOW	18Z37	1	0.75			N		N																		0	TRAINING FLITE.FEATHERS 1ST STATOR VANE	335
		1				N		N																		0	DEBRIS IN BOOSTER & COMP INLET.GRD INSP.	293
		1		Y		N	5.9	N		Y		Y														1	2 FB DE, 8 FB RPLCD	266
PREY	2K1	1	55												Y											2	6 SETS FB RPLCD.	235
		1				N		N																		0	GROUND INSP	279
G-NECKED PHEASANT	4L161	1	34			N		N																		0	NO CORE ING	294
		1				N		N																		0	GRD INSP.	295
		1				N		N																		0	GRD INSP	296
NADA GOOSE	2J30	1	128		1	N	N	N													Y				Y	2	16 HPC BL BE-NOT SOFT BODY PRE DLVRY	208
MMON WOOD PIGEON	2P9	1	18		FL	N		N																	Y	1	3FB UNK DMG. 2 PR FB RPLCD.	297
					1	N		N																		0	BIRD ING. INTO CORE	298
YPTIAN VULTURE	3K43	1	75			N	2.6	N					Y	Y			Y									2	FANSET RPL,MIN DMG INLETCOWL,ACOU.PANEL	299
		1				N		N																		0	GROUND INSP	280
MMON SKYLARK	17Z72	1	1.5			N		N																		0	DEBRIS ON COWL,FB'S,SPINNER,PRIM.GASPATH	300
		1				N		N	Y	Y	Y															1	1 FB WITH DE & AXIAL CRACK RPLCD.	301
		1				N		N																		0	GRD INSP AT PHAPHOS,CYPRUS	302
WK"		1			1	N				Y				Y												1	TAXI OUT. 1FB NICKED.FAIRING DELAM	236
		1				N		N		Y																1	2 FB LE BE. WALKAROUND	258
		1				N		N																		0	HIT FAN OGV'S & INLET GOWL LIP.GRD INSP.	281
RICAN FISH EAGLE	3K34	1	100			N	3.4	N				Y													Y	2	VIBES ON SUBS.FLITE. 5FB RPLD,3FB SHGLD.	303
		1				N	4.9	N		Y																1	3 FB BE. BANG. NO SURGE. PARAMETER SHIFT	259
LL" 24 oz.		1		N	1	N		N																		0	AT TOUCHDOWN.	304
RTRIDGE" 15OZ.		1				N	INC	Y	Y																	1	3 PR FB RPLCD LE DISTORTION	267
		1				N		N		Y																1	FB#11 DE & REPAIRED	305
		1				N		N													Y					2	STG 1 HPC BL BE DE	282
TLE BROWN BAT	BAT	1	0.3		1	N	N	N																		0	BAT HIT COWL.	237
		1				N		N																		0	BIRD HIT FB'S, OGV, LPC IGV'S	306
		1				N		N																		0	GRD. INSP	283
ACK KITE	3K28	1	28																								SHOP FINDING. LITTLE DATA. DAMAGED??	249
RFALCON	5K55	1	46.4			N																				0		239
						N	N	N															Y			1	SPINNER RUBBER TIP DMGD	209
		1				N		N																		0	BLOOD IN CORE INLET.GRD INSP.	284
MMON LAPWING	5N1	1	7.7			N		N		Y																1	2 FB RPLCD	285
		1				N		N																		0	GRD INSP	307
RGE"		1				N	N	N																		0	HEAVY DEBRIS IN BY-PASS "LG"BD	210
		2				N	INC	N			Y												Y		Y	2	5FBDMGD,2FBLE TEARS.2 SPINNER CONESRPLCD	268
TLE EGRET	1/50	1	17			N																				0	BIRD EXITED FAN AIR EXHAUST	248
						N	N	N																		0	MEXICAN GOVT A/C	211
		1				N	HIGH	N							Y											2	HIGH N1 VIBES.4FB BENT,RPLCD AT MGQ.	635
		1				N		N																		0	GRD. INSP.	308
		1				N	3.4	N																	Y	2	4 FB UNK DMG BEYOND LIMITS	309
RRING GULL	14N14	1	40		Y	INVLNTRY.NRSURGE	INC	HIEGT,VIBES													Y				Y	2 •	FUEL DUMPED.NON-RECOV.SURGE,VIBES,HI EGT	247
		1				N																				0	INTO CORE	250
MALL SEAGULL"		1			1	N																				0	SMELL. 8-12 OZ.SEAGULL.	238
DDY TURNSTONE	6N30	2	4		N	N		N																		0	WALKAROUND AT FUK	334
		1				N		N																		0		618
		1				N		N																		0	GRD INSP. NO CORE ING.	310
		1				N		N													Y			Y		2	SLITE HPC8THSTGVANE YIELDING.5OGVSPACERS	269
		1				N	1.9	N				Y														1	3 FB SHINGLED-REPLCD.	311
IUKAR	4L37	1	18			N		N																		0	BIRD HIT MIDSPAN SHROUD AREA	312
		1				N		N																		0	CORE ING.	313
		1				N	N	N													Y					2	UNK# IPC BL DMG. ENG RMVD	212
GEON"-MEDIUM		1			1	N		N																	Y	2	17 FB DMGD, REPLCD	270
		1				N		N																		0	ALL ENG PARAMS NORMAL	271
		1				N		N																		0	BIRD HIT SPINNER.GRD INSP	286
MMON WOOD PIGEON	2P9	1	18			N	6.0	N	Y						Y									Y		2	7FB SEVERE DMG,DEFORM.SHRDS.5PR FB RPLCD	272
MMON ROCK DOVE	2P1	1	14		FL	N		N																		0	BIRD ENTERED BOOSTER,EXITED VBV DOOR	314
SEATE TERN	14N58	1	4			N		N																		0	FEATHERS R-6 BLOCKER DOOR	434
		1				N	N	N																		0	ENG PARAMS NORMAL	490
		1				N	N	N																		0	DEBRIS FOUND GROUND INSP.	213
		1				N		N																		0	BIRDS HIT ENG, COCKPIT CABIN FLOCK????	287
MALL"		2				N		N				Y														1	VIBES ON SUBSEQUENT FLITES.FAN SET RPLCD	273
		1				N		N																		0		485
		1				N		N																		0	FINAL APPROACH INTO KOCHI.	619
RRING GULL	14N14	>1	32		SE	N	N	N																		0	DEBRIS DOWN BY-PASS	214
RRING GULL	14N14	4-5	32		SE	N	N	N																		0	3 BDS HIT FAN, 1-2 DOWN CORE	214
		1				N		N																		0	ODOR IN COCKPIT. ALL ENG PARAMS NORMAL	274
ACK KITE	3K28	1	28	N	1	N	3.0	N	Y	Y														Y		1	3 FB BE, 3 OGV'S SPLIT TRAILINO EDGE	315
		1				N		N																		0	WALKAROUND.FRESH REMNS FB'S & EXIT VANES	246
		1				N		N																		0	GRD INSP	288
		1				N		N																		0	BIRD HIT FAN BOOSTER IGV 6:00 POSITION	289
		1				N		N																		0	GRD INSP.	290
		1				N		N																		0		620
		1				N		N																		0	GRD INSP	291
		1				N		N													Y					2	OFF-WING INSP.HPC STG 1 BLADE DMG.	636

DATE	EVT	A/C	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	FLR	LTCON	WEATHER	CREW	CITYPRS	APT	LOCALE	US	REGION	BIRDNAME
06/27/90	241	B747	JT9D	7Q	3	15:15	TR	N	0	VR				DIV	LXS-ATH	LXS	LEMNOS,GREECE	N	EUROPE	HERRING GULL
06/27/90	621	B767	CF6	80A	2			N						N	-NGS	XFO	NAGASAKI,JAPAN??	N		
06/29/90	240	B767	JT9D	7R4E	2	15:29	CL	N	400				SCLD	ATB	WLG-MEL	WLG	WELLINGTON,NEW ZEALAND	N	AUS.NEW Z.	SILVER (RED-BILLED) GULL
06/29/90	275	A320	CFM56	5	1		TR	N	0	V1-				N	FRA-	FRA	FRANKFURT,GERMANY	N	EUROPE	
06/29/90	622	B767	CF6	80A	2			N						N	-KMI	XFO	MIYAZAKI,JAPAN??	N		
06/29/90	637	B767	CF6	80C2	2		LR	N	0					N	-HIJ	HIJ	HIROSHIMA,JAPAN	N	PACIFIC	
07/01/90	486	B757	2000	2037	2			N						N		XUS		Y	N.AMERICA	
07/02/90	242	B767	4000	4060	1	8:10	AP	N						N	EWR-CPH	CPH	COPENHAGEN,DENMARK	N	EUROPE	EURASIAN KESTREL
07/02/90	322	A300	4000	4158	1			N						N	YUL-ORY	XFO	MONTREAL OR PARIS	N		CHIMNEY SWIFT
07/05/90	337	B757	RB211	535E4	2			N						N		XUS	TULSA,OKLAHOMA ??	Y	N.AMERICA	
07/05/90	369	A310	CF6	80C2	1		AP	N	400		VFR	OVRCST		N	-TLS	TLS	TOULOUSE,FRANCE	N	EUROPE	"SMALL BIRD"
07/06/90	339	B757	RB211	535C	2	13:04	TR	N	0	120			SCLD	ATB	LHR-	LHR	LONDON-LHR,ENGLAND,UK	N	EUROPE	"PIGEON"-MEDIUM
07/08/90	488	B757	2000	2037	1		TC	N							MIA-	MIA	MIAMI,FLORIDA	Y	N.AMERICA	
07/12/90	254	B767	4000	4060	1			N							CPH-CPH	CPH	COPENHAGEN,DENMARK	N	EUROPE	
07/12/90	623	B767	CF6	80A	2		TR	N	0	120		DAY		N	SHI-	SHI	SHIMOJISHIMA,JAPAN	N	PACIFIC	"HERON"
07/13/90	370	B767	CF6	80C2	2		TX	N	0	TAX'				N		XFO	TOKYO-HND,JAPAN??	N	PACIFIC	
07/14/90	371	A300	CF6	80C2	2	7:06	TR	N	0	138			OVERCAST	ATB	BGI-	BGI	BARBADOS,BARBADOS	N	S.AMERICA	"EGRET"-MEDIUM
07/14/90	372	A310	CF6	80C2	2		CL	N						N	CFU-MUC	CFU	CORFU,GREECE	N	EUROPE	EGYPTIAN VULTURE
07/14/90	624	B767	CF6	80A	2			N						N		XFO		N		
07/15/90	338	B757	RB211	535E4	2			N						N	AMS-YYZ	XFO	AMSTERDAM OR TORONTO	N		KILLDEER
07/16/90	345	A320	CFM56	5	2			N						N	-DUS	XFO	DUSSELDORF,GERMANY??	N		
07/17/90	252	A300	JT9D	7R4H	2	19:45	TR	N	0					N	RUH-ABT	RUH	RIYADH,SAUDI ARABIA	N	MID.EAST	
07/17/90	373	B767	CF6	80C2	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N		
07/18/90	355	A310	CF6	80A	2		DA	N	100	130				N	-NCE	NCE	NICE,FRANCE	N	EUROPE	HERRING GULL
07/19/90	625	B767	CF6	80A	2	19:31	DA	N	1000	128	IFR			N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	PACIFIC	
07/22/90	255	B767	JT9D	7R4E	1	20:00	CL	N					RAIN	ATB	PER-NRT	PER	PERTH,AUSTRALIA	N	AUS.NEW Z.	BANDED PLOVER
07/22/90	626	B767	CF6	80A	1	8:05	AP	N	200					N	-SYD	SYD	SYDNEY,AUSTRALIA	N	AUS.NEW Z.	SILVER (RED-BILLED) GULL
07/23/90	253	B767	JT9D	7R4E	2			N						N		XFO	ETHIOPIA???	N		
07/23/90	638	B767	CF6	80C2	2	19:47	AP	N	30	132				N		XFO		N		
07/24/90	321	DC10	JT9D	59A	1		TC	N						N	NGO-FUK	NGO	NAGOYA,JAPAN	N	PACIFIC	
07/24/90	356	A310	CF6	80A	2			N						N	AMS-LCA	XFO	AMSTERDAM OR LARNACA	N		COMMON ROCK DOVE
07/24/90	374	B767	CF6	80C2	1			N						N	-OSA	XFO	OSAKA,JAPAN??	N		
07/24/90	375	B767	CF6	80C2	2			N						N	-MYJ	XFO	MASUYAMA,JAPAN??	N		
07/25/90	320	B767	JT9D	7R4D	1		LA	N						N	-FUK	FUK	FUKUOKA,JAPAN	N	PACIFIC	
07/25/90	627	B767	CF6	80A	2		LR	N	0					N	-NGO	NGO	NAGOYA,JAPAN	N	PACIFIC	
07/25/90	639	B767	CF6	80C2	2		LR	N	0					N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	PACIFIC	
07/27/90	256	B767	JT9D	7R4D	2	20:00	LA	N						N	MYJ-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	
07/27/90	319	DC10	JT9D	59A	1			N						N	OKI-HND	XFO	OKI ISLAND/TOKYO-HND,JAPAN	N	PACIFIC	
07/28/90	262	A310	4000	4152	2		CL	N							KHI-	KHI	KARACHI,PAKISTAN	N	ASIA	
07/28/90	318	DC10	JT9D	59A	1			N						N	OSA-PUS	XFO	OSAKA,JAPAN/PUSAN,KOREA	N		
07/28/90	346	A320	CFM56	5	1		LR	N	0					N	-YUL	YUL	MONTREAL,CANADA	N	N.AMERICA	RING-BILLED GULL
07/28/90	357	B767	CF6	80A	1			N						N	-KOJ	XFO	KAGOSHIMA,JAPAN???	N		
07/29/90	358	B767	CF6	80A	2			N						N	-KMI	XFO	MIYAZAKI,JAPAN??	N		
07/30/90	257	B757	2000	2037	2	7:15	CL	TRANSVERSE FRAC.	800					ATB	LAX-SLC	LAX	LOS ANGELES,CAL.	Y	N.AMERICA	WESTERN GULL
07/30/90	376	A300	CF6	80C2	1			N						N	-BKK	XFO	BANGKOK,THAILAND??	N		
07/30/90	640	B767	CF6	80C2	2			N						N	-MYJ	XFO	MATSUYAMA,JAPAN??	N		
07/31/90	377	A310	CF6	80C2	1		LR	N	0					N	-DEL	DEL	DELHI,INDIA	N	ASIA	
08/01/90	260	B757	2000	2037	1			N						N	-DTW	XUS	DETROIT,MICHIGAN???	Y	N.AMERICA	AMERICAN ROBIN
08/01/90	261	B757	2000	2040	2			N							ABY-MOB	XUS	ALBANY,GA OR MOBILE,ALA	Y	N.AMERICA	AMERICAN MOURNING DC
08/01/90	492	B747	4000	4056	2			N						N		XXX		U		
08/01/90	628	B767	CF6	80A	2		LR	N	0					N	-KMI	KMI	MIYAZAKI,JAPAN	N	PACIFIC	
08/04/90	359	B767	CF6	80A	2		LR	N	0					N	-KCZ	KCZ	KOCHI,JAPAN	N	PACIFIC	
08/05/90	263	B747	JT9D	7Q	4		TR	POWER LOSS	0	V1-				ATO	JFK-	JFK	NEW YORK-JFK,NY	Y	N.AMERICA	HERRING GULL
08/05/90	316	B767	4000	4060	1	6:08	TO	N	500				FOG	ATB	AMS-HER	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	"GULL"-MEDIUM
08/06/90	347	A320	CFM56	5	1		TR	N	0	V1+				DIV	LIL-LYN	LIL	LILLE,FRANCE	N	EUROPE	COMMON BARN OWL
08/08/90	324	A300	4000	4158	1			N						N	JIB-ORY	XFO	DJIBOUTI OR PARIS	N		DON-SMITH'S NIGHTJAR
08/10/90	317	A300	4000	4158	1		TC	N						ATB	SEL-PUS	SEL	SEOUL,KOREA	N	ASIA	CHIMNEY SWIFT
08/10/90	378	A310	CF6	80C2	1			N						N	-BOM	XFO	BOMBAY,INDIA??	N		
08/10/90	641	B767	CF6	80C2	1		AP	N						N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	PACIFIC	
08/12/90	325	B767	4000	4060	1			N						N	-AMS	XFO	AMSTERDAM,NETHERLANDS??	N	EUROPE	
08/12/90	379	B767	CF6	80C2	1			N						N	ORY-ALG	XFO	PARIS-ORLY OR ALGIERS	N		
08/12/90	629	B767	CF6	80A	1			N						N	-TOY	XFO	TOYAMA,JAPAN??	N		"BAT"
08/13/90	348	A320	CFM56	5	1	14:35	TR	N	0	125			NCLD	N	BRE-	BRE	BREMEN,GERMANY	N	EUROPE	"DOVE"-MEDIUM
08/13/90	630	B767	CF6	80A	2	19:12	LR	N	0			NIGHT		N	-TOY	TOY	TOYAMA,JAPAN	N	PACIFIC	"BAT"
08/13/90	642	B767	CF6	80C2	2		LR	N	0					N	-OIT	OIT	OITA,JAPAN	N	PACIFIC	
08/14/90	323	B757	2000	2037	1		TO	MEMB	10	VR+				N	JFK-SLC	JFK	NEW YORK-JFK,NY	Y	N.AMERICA	RING-NECKED PHEASANT
08/14/90	323	B757	2000	2037	2		TO	MEMB	10	VR+				N	JFK-SLC	JFK	NEW YORK-JFK,NY	Y	N.AMERICA	RING-NECKED PHEASANT
08/15/90	631	B767	CF6	80A	2		LR	N	0					N	-TTJ	TTJ	TOTTORI,JAPAN	N	PACIFIC	
08/16/90	360	B767	CF6	80A	2		LR	N	0					N	-OKJ	OKJ	OKAYAMA,JAPAN	N	PACIFIC	
08/16/90	380	A310	CF6	80C2	2	11:15	AP	N	50	140			NCLD	N	-NTE	NTE	NANTES,FRANCE	N	EUROPE	"SWALLOW" OR "SWIFT"1
08/17/90	632	B767	CF6	80A	1		LR	MESB	0					N	-TOY	TOY	TOYAMA,JAPAN	N	PACIFIC	"BAT"
08/17/90	632	B767	CF6	80A	2		LR	MESB	0					N	-TOY	TOY	TOYAMA,JAPAN	N	PACIFIC	"BAT"
08/20/90	349	A320	CFM56	5	1			N						N	-LYN	XFO	LYON,FRANCE??	N		
08/20/90	350	A320	CFM56	5	1		LR	N	0					N	-DUS	DUS	DUSSELDORF,GERMANY	N	EUROPE	
08/21/90	361	A310	CF6	80A	1		LR	N	0			DUSK	CLEAR	N	-IST	IST	ISTANBUL,TURKEY	N	MID.EAST	"LGE SEAGULL" 40 OZ.
08/22/90	351	A320	CFM56	5	2		TR	N	0	V1+				N	ORY-TLS	ORY	PARIS-ORLY,FRANCE	N	EUROPE	
08/24/90	362	B767	CF6	80A	1		LR	N	0					N	-SDJ	SDJ	SENDAI,JAPAN	N	PACIFIC	
08/24/90	489	B747	JT9D	7R4	3		LA	N						N	SIN-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	
08/25/90	352	A320	CFM56	5	1			N						N	-YUL	XFO	MONTREAL,CANADA???	N		
08/25/90	643	B767	CF6	80C2	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N		
08/27/90	330	B767	4000	4060	1	8:30		N						N	-CPH	XXX	COPENHAGEN??	U		MEADOW PIPIT
08/28/90	363	B767	CF6	80A	2		LR	N	0					N	-TAK	TAK	TAKAMATSU,JAPAN	N	PACIFIC	
08/29/90	327	B747	JT9D	7R4G2	4		AP	N						N	-FRA	FRA	FRANKFURT,GERMANY	N	EUROPE	
08/30/90	633	B767	CF6	80A	1			N						N		XFO		N		"SPARROW" 1 OZ.
08/31/90	381	B747	CF6	80C2	3		LR	N	0	100		DAWN	CLEAR	N	-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	
09/03/90	328	B747	JT9D	7Q	4	8:27	TR	POWER LOSS	0	170			SCLD	ATB	DEL-SIN	DEL	DELHI,INDIA	N	ASIA	BLACK KITE
09/04/90	264	A300	4000	4152	1		TC	N						N	SEL-HKG	SEL	SEOUL,KOREA	N	ASIA	

	BIRDNAME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	VIBE	IFSD	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	NMS	F	REMARKS	EVT
	HERRING GULL	14N14	1	40	N	FL	N	HIGH	VIBES			Y			Y	Y		Y									2		COWL PEN.4FB BE,1 BROKEN,PIECE HIT#4 ENG	241
			1				N		N																		0			621
Z	SILVER (RED-BILLED) GULL	14N32	1	11			N	HIGH	N		Y		Y														1		1FB BE.VOL POWER RED.ATB DUE TO VIBES.	240
			1				N		N																		0		ODOR IN CABIN. STAINS ON FAN & CORE	275
			1				N		N																		0		BORESCOPED.	622
			1				N		N																		0			637
:A			1						N		Y			Y				Y									2		2FB BROKEN.2 SETS RPLCD.	486
	EURASIAN KESTREL	5K27	1	8		1	N																				0		RMNS ON FAN EXIT VANE	242
	CHIMNEY SWIFT	1U33	1	1							Y																1		1 FB BE.	322
:A			1				N	N	N	Y	Y																1		2 FB LE CURL	337
	"SMALL BIRD"		1			1	N		N																		0			369
	"PIGEON"-MEDIUM		1			SE	N	4.0	N		Y		Y														1		3 FB BE. 2 FB SHGLD.ATB DUE TO VIBES.	339
:A			1																							Y	1		2 SETS FB RPLCD.	488
			1			FL	N																				0		HIT LPC INLET,FAN EXIT VANES.TRNG FLITE	254
	"HERON"		1				N		N																		0		-V1	623
			1				N	3.2	N													Y					2		1HPC BL LE TIP MSNG,MDSPNSHRD OVLAP.RMVD	370
:A	"EGRET"-MEDIUM		1				N		N	Y	Y	Y													Y		1		1FB BE,CRACKED, NOTCHED 1FB LE NICKED	371
	EGYPTIAN VULTURE	3K43	1	75		1	N		N	Y						Y						Y					2		4 FB LE BE.2 HPC BL "NICKS".ENG RMVD.	372
			1				N		N																		0			624
	KILLDEER	5N33	1	3			N	N	N																		0		DEBRIS ON OGV'S. WALKAROUND.	338
			1				N		N																		0		DEBRIS ON FB'S & 1ST STG LPC.	345
		TBI	1			N	N	INC								Y		Y									2		4 FB BE, 1 BRK OUT	252
			1				N		N																		0		GRD INSPECT. AT TYO	373
	HERRING GULL	14N14	1	40		SE	N		N				Y														1		4 FB SHINGLED, REPLACED	355
			1				N		N																		0			625
Z	BANDED PLOVER	5N23	1	7		1	N				Y							Y									2		1 FB LE BRKN, 2 FB BE. HIGH VIBES ON LDG	255
Z	SILVER (RED-BILLED) GULL	14N32	1	11			N		N																		0			626
			1			N	N																				1		1 FB BE	253
			1				N		N																		0			638
			1				N																				0		SMELL.INTO CORE.	321
	COMMON ROCK DOVE	2P1	1	14			N		N																		0		DEBRIS IN CORE	356
			1				N		N																		0		GRD. INSP. AT OSAKA	374
			1				N		N																		0		GRD INSP AT MATSUYAMA	375
			1				N																				0			320
			1				N		N																		0			627
			1				N		N																		0			639
			1				N		N																		0		DISCOVERED UPON ENGINE REMOVAL	256
			1				N																				0			319
			1				N				Y															Y	1		#BIRDS?	262
			1				N																				0			318
:A	RING-BILLED GULL	14N12	1	17			N		N																	Y	1		1FB DMGD. DEBRIS IN OGV'S	346
			1				N		N																		0		BIRD INTO CORE.	357
			1				N		N																		0		GRD. INSP. AT MIYAZAKI	358
:A	WESTERN GULL	14N19	1	40.4			50%	HIGH	VIBES	Y				Y	Y	Y			Y	Y		Y					2	*	CONTND.3FB FRACT 3"BELOW MDSPN SHROUD	257
			1				N	HIGH	N													Y					2		2 HPC BL TIPS MSNG,7 W/LE TIP CURL.REMVD	376
			1				N		N																		0			640
			1				N		N													Y					X		OLD HPC DMG NOT BY BIRD,IN LIMITS	377
:A	AMERICAN ROBIN	41Z314	1	2.5			N				Y															Y	1		UNCONFIRMED. 3 FB BE BEYOND LIMITS	260
:A	AMERICAN MOURNING DOVE	2P105	1	4			N		N		Y	Y															1		2 FB DMGD.1 BLD TORN	261
			1				N		N																		0		HIT OUTSIDE SHROUD	492
			1				N		N																		0			628
			1				N		N																		0			359
:A	HERRING GULL	14N14	1	40			NR SURGE,HI EGT															Y					2	*	SURGE,HI EGT. 5TH STG BL/VA CLASH.	263
	"GULL"-MEDIUM		1		N	SE	N	INC								Y											2		4 FB BE.ATB DUE TO VIBES.	316
	COMMON BARN OWL	1S2	1	11			N	5.8	N				Y									Y					2		HPC STG 5&9 DMG.ENG CHANGED.DIV TO ORLY	347
	DON-SMITH'S NIGHTJAR	5T55	1	1.25			N																				0		WALK AROUND.	324
	CHIMNEY SWIFT	1U33	1	1					NOT BIRD														Y				X	?	TURBINE FAILURE-CASTING DEFECT.NOT BIRD.	317
			1				N		N					Y											Y		1		GRD INSP AT BOMBAY.ACCOU.PANEL,OGV DMG	378
			1				N		N																		0		FINAL APPROACH AT MYJ	641
			1				N																				0		WALK AROUND.	325
			1				N		N																		0		DEBRIS ON SPINNER AND FB'S	379
	"BAT"	BAT	1	1			N		N																		0			629
	"DOVE"-MEDIUM		1		N	1	N	INC	N																		0		NI VIBES FLUCTUATED.ODOR IN CABIN.	348
	"BAT"	BAT	1	1			N		N																		0		1 OR MORE BATS INGESTED	630
			1				N		N																		0			642
:A	RING-NECKED PHEASANT	4L161	>1	40			N							Y				Y									2		SMELL.1 FB BKN.BIRD BROKEN UP BY SPINNER	323
:A	RING-NECKED PHEASANT	4L161	1	40			N			Y		Y		Y													2		3 FB LE DEF,1TORN.SMELL.BIRD BROKEN UP	323
			1				N		N																		0		BIRDSTRIKE TO COWL.SAME ENG. AS #630.	631
			1				N		N																		0			360
	"SWALLOW" OR "SWIFT"1 OZ		1		N	FL	N		N																		0		HIT WINDSHIELD,RADOME	380
	"BAT"	BAT	1	1			N		N																		0		BAT HIT COWL	632
	"BAT"	BAT	1	1			N		N																		0		BAT HIT COWL.	632
			1				N		N																		0		GRD INSPECTION AT LYON	349
			1				N		N																		0			350
	"LGE SEAGULL" 40 OZ.		1				N	3.5	N	Y	Y		Y														1		1 FB LE BE, 2 FB SHGLD.40oz.GENERIC GULL	361
			1				N		N		Y																1		2 FB BE	351
			1				N		N																		0			362
			1				N		N																		0			489
			1				N		N													Y					2		STG1BL CRACK,2BL PIECE MISSING.NO FB DMG	352
			1				N		N																		0			643
	MEADOW PIPIT	47Z36	1	0.65			N		N																		0		WALKAROUND AT CPH	330
			1				N		N		Y																1		1 FB BE - TRIMMED	363
			1				N																				0		NO PARAMETER SHIFTS	327
	"SPARROW" 1 OZ.		1				N		N																		0			633
			1				N		N		Y																1		2 FB DISTORTED, RPLCD.	381
	BLACK KITE	3K28	1	28		1	NON-RECOV.SURGE		HI EGT													Y					2	*	NON-RECOV.SURG.STG5 HPC,IGV CLASH	328
			1				N		N																		0			264

DATE	EVT	A/C	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	FLR	LTCON	WEATHER	CREW	CITYPRS	APT	LOCALE	US	REGION	BIRDNAME	S
09/04/90	336	A300	4000	4152	1		TO	N						N	SEL-HKG	SEL	SEOUL,KOREA	N	ASIA	GREAT EGRET	1
09/04/90	353	A320	CFM56	5	2		LR	N	0					N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE		
09/04/90	382	B747	CF6	80C2	1	7:00	LR	MEMB	0	120		DAWN	CLEAR	N	-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	BLACK-HEADED GULL	14
09/04/90	382	B747	CF6	80C2	2	7:00	LR	MEMB	0	120		DAWN	CLEAR	N	-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	BLACK-HEADED GULL	14
09/04/90	383	A310	CF6	80C2	2	22:00	LR	N	0		VFR	DARK	CLEAR	N	YYZ-YVR	YVR	VANCOUVER,CANADA	N	N.AMERICA	GLAUCOUS-WINGED GULL	14
09/05/90	364	A310	CF6	80A	1		AP	N				BRIGHT	CLEAR	N	-IST	IST	ISTANBUL,TURKEY	N	MID.EAST	HERRING GULL	14
09/05/90	365	A310	CF6	80A	2		CL	N				DUSK	RAIN	DIV	IST-DXB	IST	ISTANBUL,TURKEY	N	MID.EAST		
09/06/90	340	B757	RB211	535C	1	19:27	LR	N	0	085			SCLD	N	LHR-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	"BUZZARD"-LARGE(CONFRMD)	
09/07/90	329	B757	2000	2037	2			N								XUS		Y	N.AMERICA		
09/08/90	612	A320	CFM56	5	1			N						N	-YUL	XFO	MONTREAL,CANADA??	N			
09/09/90	384	B767	CF6	80C2	1			N						N	-KOJ	XFO	KAGOSHIMA,JAPAN??	N			
09/09/90	644	B767	CF6	80C2	1			N						N		XFO		N			
09/10/90	354	A320	CFM56	5	1			N						N	-DTW	XUS	DETROIT,MICHIGAN??	Y	N.AMERICA		
09/10/90	385	B767	CF6	80C2	1			N						N	-TOY	XFO	TOYAMA,JAPAN??	N			
09/10/90	386	B767	CF6	80C2	2		TR	N	0	V1+				N	YYZ-YUL	YYZ	TORONTO,CANADA	N	N.AMERICA		
09/11/90	387	A310	CF6	80C2	2		TR	N	0	V1+	VFR	OVRCST	RAIN	ATB	MBA-	MBA	MOMBASA,KENYA	N	AFRICA	AFRICAN FISH EAGLE	3
09/13/90	332	B767	4000	4060	2			N						N		XXX		U			
09/13/90	388	B767	CF6	80C2	1			N						N	-CTS	XFO	SAPPORO-CHITOSE,JAPAN??	N			
09/13/90	450	B757	2000	2037	1		TR	N	0	150			CLEAR	ATB	LHA-	LHA	LAHR,GERMANY	N	EUROPE		
09/17/90	331	B747	4000	4056	3		TR	N	0	120				N	HKG-SIN	HKG	HONG KONG	N	ASIA	BLACK KITE	3
09/17/90	333	B747	JT9D	7R4G2	3		TX	MEMB	0	TAXI				N	DTW-ANC	ANC	ANCHORAGE,ALASKA	Y	N.AMERICA	YELLOW-RUMPED WARBLER	63
09/17/90	333	B747	JT9D	7R4G2	4		TX	MEMB	0	TAXI				N	DTW-ANC	ANC	ANCHORAGE,ALASKA	Y	N.AMERICA	CANADA GOOSE	2
09/17/90	366	B767	CF6	80A	2		LR	N	0					N	-OKJ	OKJ	OKAYAMA,JAPAN	N	PACIFIC		
09/17/90	389	B767	CF6	80C2	2		LD	N	10					N	-WAW	WAW	WARSAW,POLAND	N	EUROPE	BLACK-HEADED GULL	14
09/18/90	341	B747	RB211	524G	2			N						N	PAE-PAE	PAE	EVERETT,WASHINGTON	Y	N.AMERICA		
09/18/90	342	B757	RB211	535C	2	18:05	LR	N	0	122				N	LHR-GVA	GVA	GENEVA,SWITZERLAND	N	EUROPE	"BUZZARD"-MEDIUM	
09/18/90	367	B767	CF6	80A	2			N						N	-OSA	XFO	OSAKA,JAPAN??	N			
09/18/90	390	B767	CF6	80C2	2			N						N	-AUH	XFO	ABU DHABI,U.A.E.??	N			
09/19/90	391	A310	CF6	80C2	2	7:49	LR	N	0	100			OVERCAST	N	-MUC	MUC	MUNICH,GERMANY	N	EUROPE	"GULL"-MEDIUM	
09/19/90	438	A300	4000	4158	2	9:15	TR	N	0	130			NCLD	N	ORY-DJE	ORY	PARIS-ORLY,FRANCE	N	EUROPE	BLACK-HEADED GULL	14
09/20/90	453	A320	V2500	A1	2	1:10	AP	N		125				N	DEL-AMD	AMD	AHMEDABAD,INDIA	N	ASIA		
09/21/90	724	A310	CF6	80C2	2	7:09	TR	N	0	070			RAIN	N	BRE-	BRE	BREMEN,GERMANY	N	EUROPE	"GULL-MEDIUM"	
09/22/90	432	B757	2000	2037	1			N						N		XUS		Y	N.AMERICA	SWAINSON'S THRUSH	41
09/23/90	343	B747	RB211	524G	4	8:08	TO	N						N	SYD-MEL	SYD	SYDNEY,AUSTRALIA	N	AUS.NEW Z.	"GULL"-MEDIUM	
09/24/90	368	A310	CF6	80A	2		TO	N	10	150				N	BRE-FRA	BRE	BREMEN,GERMANY	N	EUROPE	"SEAGULL" 20 oz.	
09/24/90	497	A300	JT9D	7R4H	2		TR	N	0	080				ATO	JED-SAH	JED	JEDDAH,SAUDI ARABIA	N	MID.EAST		
09/25/90	431	B757	2000	2037	2		TR	N	0	080				N	SLC-SFO	SLC	SALT LAKE CITY,UTAH	Y	N.AMERICA		
09/27/90	437	DC10	JT9D	59A	1	12:40	TR	SEMB	0					ATO	NGO-SIN	NGO	NAGOYA,JAPAN	N	PACIFIC	"MIDSIZE"	
09/28/90	430	A310	JT9D	7R4E1	2			N						N	SIN-KUL	XFO	SINGAPORE OR KUALA LUMPUR	N	PACIFIC		
09/30/90	392	B767	CF6	80C2	1		LR	N	0					N	-OIT	OIT	OITA,JAPAN	N	PACIFIC		
10/01/90	410	B767	CF6	80C2	1		TR	N	0	V1+				N	MRU-THR	MRU	MAURITIUS,MAURITIUS	N	AFRICA		
10/02/90	433	B757	2000	2037	1		TR	N	0	120				ATO	FAR-MSP	FAR	FARGO,N.DAKOTA	Y	N.AMERICA	FRANKLIN'S GULL	14
10/03/90	403	A310	CF6	80A	1			N						N	-FRA	XFO	FRANKFURT,GERMANY??	N		COMMON BUZZARD	3
10/08/90	393	A320	CFM56	5	2			N						N	-FRA	XFO	FRANKFURT,GERMANY???	N			
10/12/90	411	A310	CF6	80C2	1			N						N	LON-LIS	XFO	LISBON OR LONDON	N	EUROPE		
10/12/90	436	B767	JT9D	7R4D	1		TR	N	0	100				ATB	ORD-FRA	ORD	CHICAGO,ILLINOIS	Y	N.AMERICA	AMERICAN MOURNING DOVE	2
10/14/90	435	B747	JT9D	7Q	4	12:22	TR	TRANSVERSE FRAC.	0	150			NCLD	ATO	DEL-FRA	DEL	DELHI,INDIA	N	ASIA	"EAGLE" OR "VULTURE"	
10/16/90	412	B747	CF6	80C2	2		LR	N	0	100			CLEAR	N	-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	HUNGARIAN PARTRIDGE	4
10/17/90	394	A320	CFM56	5				N						N		XUS		Y	N.AMERICA	HORNED LARK	1
10/17/90	441	B747	4000	4056	3			N						N	-JFK	XXX	NEW YORK-JFK,NY??	U			
10/22/90	404	B767	CF6	80A	2		LR	N	0					N	-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC		
10/22/90	423	B747	RB211	524G	4			N						N	LHR-MAN	XFO	LONDON-LHR/MANCHESTER,UK	N	EUROPE		
10/23/90	413	B747	CF6	80C2	4			N						N	-SPN	XFO	SAIPAN,MARIANA IS??	N			
10/28/90	414	A300	CF6	80C2	2			N						N	-BKK	XFO	BANGKOK,THAILAND???	N			
10/29/90	415	B767	CF6	80C2	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N			
10/29/90	416	B767	CF6	80C2	1		CL	N						N	PUS-SEL	PUS	PUSAN,KOREA	N	ASIA	COMMON SNIPE	6
10/30/90	439	B767	4000	4060	2			N						N	-HAM	XFO	HAMBURG,GERMANY????	N			
10/30/90	443	B757	2000	2037	1			N						N		XUS		Y	N.AMERICA	AMERICAN MOURNING DOVE	2
11/01/90	395	A320	CFM56	5	2		TR	N	0	V1-				ATO	LIL-	LIL	LILLE,FRANCE	N	EUROPE	HERRING GULL	1
11/03/90	424	B757	RB211	535E4	2		TR	N	0	105				ATO	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	RING-NECKED PHEASANT	4
11/03/90	440	B767	JT9D	7R4E	2		LD	N						N	-NBO	NBO	NAIROBI,KENYA	N	AFRICA		
11/06/90	405	B767	CF6	80A	2			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N			
11/06/90	406	B767	CF6	80A	2			N						N	-OSA	XFO	OSAKA,JAPAN??	N			
11/07/90	425	B757	RB211	535E4	2		AP	N		100				N	-ORD	ORD	CHICAGO,ILLINOIS	Y	N.AMERICA		
11/08/90	417	B767	CF6	80C2	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N			
11/08/90	454	B757	2000	2037	1	7:37	TO	N		V1+				ATB	EWR-LAX	EWR	NEW YORK-NEWARK,NJ	Y	N.AMERICA		
11/09/90	407	A310	CF6	80A	2		TR	N	0	V1		DARK	CLEAR	ATO	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	"SMALL"	
11/14/90	442	B757	2000	2037	1	11:30	TR	MEMB	0	VR				ATO	SNA-DFW	SNA	ORANGE COUNTY,CALIFORNIA	Y	N.AMERICA	COMMON ROCK DOVE	2
11/14/90	442	B757	2000	2037	2	11:30	TR	MEMB	0	VR				ATO	SNA-DFW	SNA	ORANGE COUNTY,CALIFORNIA	Y	N.AMERICA	COMMON ROCK DOVE	2
11/19/90	418	B767	CF6	80C2	1	7:20	LD	N	9	125	VFR	DARK	CLOUDS	N	YMS-WAW	WAW	WARSAW,POLAND	N	EUROPE	BLACK-HEADED GULL	1
11/20/90	408	A310	CF6	80A	2		TR	N	0	V1+				N	FNA-AMS	FNA	FREETOWN,SIERRA LEONE	N	AFRICA		
11/21/90	396	A320	CFM56	5	2	14:08	LR	N	0	080			OVERCAST	N	-NUE	NUE	NUREMBERG,GERMANY	N	EUROPE	"BUZZARD"-MEDIUM	
11/21/90	426	B757	RB211	535E4	1	9:24	TO	N	300	160				N	ANS-	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	"SMALL"	
11/23/90	397	A320	CFM56	5	1			N						N	-ORY	XFO	PARIS-ORLY,FRANCE??	N			
11/24/90	427	B757	RB211	535C	1	13:41	TR	MEMB	0	160		LIGHT		ATB	BUD-LHR	BUD	BUDAPEST,HUNGARY	N	EUROPE	COMMON GULL	1
11/24/90	427	B757	RB211	535C	2	13:41	TR	MEMB	0	160		LIGHT		ATB	BUD-LHR	BUD	BUDAPEST,HUNGARY	N	EUROPE	COMMON GULL	1
11/26/90	398	A320	CFM56	5	1		LR	N	0					N	-ESB	ESB	ANKARA-ESENBOGA,TURKEY	N	MID.EAST		T
11/29/90	419	A300	CF6	80C2	2			N						N	-BKK	XFO	BANGKOK,THAILAND??	N			
11/29/90	449	B747	JT9D	7Q	2			N							ORD-ANC	XUS	CHICAGO OR ANCHORAGE	Y	N.AMERICA		
11/30/90	399	A320	CFM56	5	2		LD	N						N	-SNA	SNA	ORANGE COUNTY,CALIFORNIA	Y	N.AMERICA		
12/02/90	409	A310	CF6	80A	1		DA	N						N	-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	"SMALL"	
12/03/90	400	A320	CFM56	5	1		TR	MESB	0	V1+				ATB	TUN-	TUN	TUNIS,TUNISIA	N	AFRICA		
12/03/90	400	A320	CFM56	5	2		TR	MESB	0	V1+				ATB	TUN-	TUN	TUNIS,TUNISIA	N	AFRICA		
12/06/90	445	A310	4000	4152	2			N						N		XXX		U			
12/10/90	487	B747	4000	4056	4		TC	N						N	SIN-TPE	SIN	SINGAPORE	N	PACIFIC		
12/13/90	447	A300	JT9D	7R4H1	1	8:10	TR	N	0					N	JED-MED	JED	JEDDAH,SAUDI ARABIA	N	MID.EAST		
12/15/90	401	A320	CFM56	5	1		TR	N	0	080				N	NCE-	NCE	NICE,FRANCE	N	EUROPE	BLACK-HEADED GULL	1

RDNAME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	VIBE	IFSD	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	NMS	F	REMARKS	EVT
EAT EGRET	1I52	1	38			N		N																		0			336
		1				N		N																		0			353
CK-HEADED GULL	14N36	2	10		FL	N		N																		0			382
CK-HEADED GULL	14N36	2	10		FL	N		N																		0			382
AUCOUS-WINGED GULL	14N22	1	48			N		N				Y														1		2 FB SHINGLED--WERE UNSHGLD	383
RRING GULL	14N14	1	40			N	3.5	N				Y												Y		1		FINL AP.2FB MIDSPN SHRD LCKUP,MINOR SHGL	364
		1				N	7.5	N	Y	Y	Y															2		3 FB TIP CURL, 1 FB TORN	365
ZZARD"-LARGE(CONFRMC)		1			SE	N	N	N																		0		ICAO HAS E1	340
																									Y	2		SEVERAL FB DMG.	329
		1				N		N													Y					2		PIECE MSING STG1 TE BL.CRACK STG1 LPC BL	612
		1				N		N																		0		WALKAROUND	384
		1				N		N																		0		BORESCOPED	644
		1				N		N																		0		GRD.INSP AT DETROIT	354
		1				N		N													Y					2		MAT.MISSING FR LE HPC 2 PLACES.ENG REMVD	385
		1				N	INC	N																		0		INC VIBES ON TO. NO CREWAC REPORTED	386
RICAN FISH EAGLE	3K34	1	100			N	HIGH	N	Y			Y														1		2 FB LE DISTORTION & SHINGLED.	387
		1			N	N		N		Y															Y	0		3 FB DMG? 3 SETS RPLCD.WALKAROUND	332
		1				N		N				Y														1		2 FB SHINGLED-LATER REPLACED	388
		1						N																	Y	1		3 SETS FB RPLCD.MIL BASE LAHR, GERMANY	450
CK KITE	3K28	1	28			SURGE		N																		S		SURGE, BANG. FLAMES	331
LOW-RUMPED WARBLER	63Z20	1	0.5		FL	N		N																		0		1 SET OF FB RPLCD? TURN ONTO TAXI WAY	333
NADA GOOSE	2J30	2	56		FL	N		N																		0		TURN ONTO TAXIWAY	333
		1				N		N																		0			366
CK-HEADED GULL	14N36	1	10		FL	N		N																		0		50-100 BIRD FLOCK.5 HIT A/C	389
						N	N	N																		0		MAIDEN FLITE	341
ZZARD"-MEDIUM					SE	N	N	N																		0		DEBRIS DOWN BYPASS DUCT	342
		1				N		N																		0			367
		1				N		N																		0		GRD INSPECT.	390
LL"-MEDIUM		1		N	1	N		N																		0		GRD.INSPECT.ICAO SHOWS E2 DMG	391
CK-HEADED GULL	14N36	1	10	N	1	N		N		Y																1		2 FB BE, 4 FB RPLCD	438
		1			FL	N		N					Y												Y	1		ACCOU.LINER DMG. 0640Z.SHORT FINALS.	453
LL-MEDIUM"		1		Y	SE	N		N																		0		GRD.INSP.MUNICH.	724
AINSON'S THRUSH	41Z246	1	1			N		N																		0		WALKAROUND	432
LL"-MEDIUM		1			FL	N	N	N					Y													1		IDG INTAKE CONTAMINATED	343
AGULL" 20 oz.		1				N	6.0	N					Y								Y				Y	2		10FB UNK DMG,RPLCD.2 HPC BLS TIP MISSING	368
		1				SURGE		N																		S		HIT SPINNER.SURGE CAUSED ATO.	497
		1			Y	N		N									Y								Y	2		8FB DMG.BREAKOUT.BLOOD NOSE COWL INTRIOR	431
DSIZE"		>1			FL	SURGE		N																		S		SURGE, HI EGT, PARAMETER FLUX	437
		1				N		N																		0		CORE ING.	430
		1				N		N																Y	Y	2		5FB,2 OGV,BLOCKER DOOR DMGD.THRUST RVRSL	392
		1				N		N	Y	Y														Y		1		3 FB BE WITHN LIMIT,1 FB RPLCD,OGV BLNDD	410
NKLIN'S GULL	14N31	1	9	Y	FL	N	HIGH	N		Y	Y															2		3 FB BE/TORN-1 HAD AXIAL CRACK AT SHROUD	433
MMON BUZZARD	3K180	1	32			N		N					Y								Y			Y		2		2 STG1 HPC BL LE TIP BRKOUT,3 OGVFAIRING	403
		1				N		N																		0		HIT SPINNER, BLADES, OGV	393
		1				N		N	Y																	1		2 FB LE DISTORT, RPLCD	411
ERICAN MOURNING DOVE	2P105	1	4		N	N	2.6	N		Y														Y		1		3 FB BE, 9 FEGV DMG.	436
GLE" OR "VULTURE"		1		N	N	INVLNTRY,NRSURGE		HI EGT					Y	Y			Y	Y								2	•	3FB FRAC,LIBTD THRU COWL,TAIL CONE LIBTD	435
NGARIAN PARTRIDGE	4L85	1	14			N		N	Y		Y															1		3 FB LE DISTORT,RPLCD,1 FB 3" TEAR	412
RNED LARK	17Z74	1	1.5			N		N																		0		OFF WING, SHOP INSP.	394
		1				N		N	Y																	L		3 FB LE BE WITHIN LIMITS	441
		1				N		N													Y					1		HPC STG1 BLADE SHINGLING-ENG CHANGED	404
		1				N	N	N					Y													1		ATTRITION LINING DMG	423
		1				N		N																		0		GRD INSP SAIPAN	413
		1				N		N	Y																	1		2 SETS FB LE DIST, RPLCD	414
		1				N		N																		0		INSP. TOKYO	415
MMON SNIPE	6N47	1	4			N	3.4	N	Y																	1		4 FB LE TIP CURL, RPLCD	416
		1				N		N																		0		GRD. INSP. HAMBURG,GERMANY	439
ERICAN MOURNING DOVE	2P105	1	4			N		N																	Y	1		2 SETS FB'S RPLCD.DRESSED SEVERAL FB'S	443
RRING GULL	14N14	1	40			N		N	Y				Y												Y	2		22 FB DMGD.SEVR ABRDBL.FULLSET FB REPLCD	395
G-NECKED PHEASANT	4L161	1	48			N	N	N		Y			Y													1		3FB BE/DE,ANNULUS FILLERS DMGD.	424
		1						N				Y					Y									2		SVERE.032"CRACK 1 FB ROOT AREA.2FB SHGLD	440
		1				N		N																		0		GRD INSPECT TYO	405
		1				N		N																		0		GRD INSP. OSAKA	406
		1				N	N	N																		0		INTO CORE	425
		1			N	N		N																		0		REMAINS ON IGV'S. TOKYO INSPECT	417
		1				N		N				Y			Y											2		5FB TIP CURL.ATB DUE TO LOUD NOISE	454
ALL"		1			1	N		N	Y																	1		2 FB LE TIP CURL, RPLCD	407
MMON ROCK DOVE	2P1	4	14		Y	SURGE		N	Y				Y		Y	Y	Y									2		8FB DMGD.SURGE.INVESTIGATED	442
MMON ROCK DOVE	2P1	2	14		Y	SURGE		N									Y				Y					2		3FB BROKEN.PRIOR HPC BLD FRACT-NOT BIRD	442
CK-HEADED GULL	14N36	1	10			N		N																		0		BIRD HIT SPINNER,EXITED BYPASS	418
		1				N		N	Y	Y																1		1 FB LE DE., 1 SET FB REPLCD	408
ZZARD"-MEDIUM		1		N	1	N		N																		0			396
ALL"		>1			SE	N	N	N	Y																	1		1 FB LE CUP DMG.	426
		1				N		N				Y														1		3 FB SHGLD, 5 FB REINSTALLED	397
MMON GULL	14N13	5	18			N	2.5	N		Y		Y														1		2FB BE/DE.3FBSHGLD.FAN SET RPLCD.ROTATON	427
MMON GULL	14N13	2	18			N	N	N		Y		Y														1		2FB BE/DE.3 SHROUDS SHGLD.FAN SET RPLCD.	427
	TBI	1				N		N	Y																	1		3 FB LE DISTORTION,REPLACED AT CDG.	398
		1				N		N	Y																	1		2 FB LE DISTORT, 2PR FB RPLCD	419
		1							Y	Y	Y						Y									2		8 FB DMG,2 CRACKED.1 PC BROKEN	449
		1				N		N				Y														1		2 SETS OF FB SHGLD	399
ALL"		1				N		N																		0		TEMP.EGT TRENDSHIFT CAUSD BY BIRD REMANS	409
		1				N	N	N																	Y	1		2 FB DMGD & RPLCD	400
		1				N	N	N																	Y	1		3 FB DMGD & REPLCD	400
						N		N																		0			445
		1				SURGE		N													Y					X		2SURGES.1 11TH STG BL DE.DMG NOT BY BIRD	487
		1			1	N		N																	Y	1		6FB DMGD, 1 BEYOND LIMITS. RUMBLE,SMELL	447
CK-HEADED GULL	14N36	1	10	Y		N		N																		0		BORESCOPED.RETURNED TO SERVICE LATE.	401

DATE	EVT	A/C	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	FLR	LTCON	WEATHER	CREW	CITYPRS	APT	LOCALE	US	REGION	BIRDNAME
12/15/90	420	A310	CF6	80C2	2	13:48	TR	N	0	090		DARK	CLEAR	ATO	BOM-	BOM	BOMBAY,INDIA	N	ASIA	COMMON BARN OWL
12/19/90	446	B757	2000	2037	2		RV	SEMB	0	080				N	ATL-MIA	MIA	MIAMI,FLORIDA	Y	N.AMERICA	RING-BILLED GULL
12/22/90	402	A320	CFM56	5	2	12:05	TR	SEMB	0	V1-			RAIN	ATO	ABZ-	ABZ	ABERDEEN,SCOTLAND,UK	N	EUROPE	SUSPECT "SEAGULL"
12/22/90	421	B767	CF6	80C2	1			N						N	-MYJ	XFO	MATSUYAMA,JAPAN??	N		
12/23/90	422	A310	CF6	80C2	2		TR	N	0	V1+				N	MBA-NBO	MBA	MOMBASA,KENYA	N	AFRICA	BLACK KITE
12/23/90	448	B757	2000	2037	1		TO	MEMB	10	VR+		DAWN	FOG	ATB	MSY-	MSY	NEW ORLEANS,LA	Y	N.AMERICA	RING-BILLED GULL
12/23/90	448	B757	2000	2037	2		TO	MEMB	10	VR+		DAWN	FOG	ATB	MSY-	MSY	NEW ORLEANS,LA	Y	N.AMERICA	RING-BILLED GULL
01/01/91	451	B747	4000	4056	4		TR	N	0	V1+				ATB	JFK-	JFK	NEW YORK-JFK,NY	Y	N.AMERICA	HERRING GULL
01/02/91	459	B767	CF6	80A	2		TR	N	0	V1+				N	MCO-MSY	MCO	ORLANDO,FLORIDA	Y	N.AMERICA	
01/02/91	460	B767	CF6	80A	1		TR	N	0	V1+				N	HND-	HND	TOKYO-HND,JAPAN	N	PACIFIC	
01/04/91	452	B767	4000	4056	1	6:30	LD	SEMB					CLEAR	N	LGW-HRE	HRE	HARARE,ZIMBABWE	N	AFRICA	RUFOUS-BREASTED SWALLOW
01/07/91	461	B767	CF6	80A	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N		
01/07/91	465	A300	CF6	80C2	1			N						N	-PHL	XUS	PHILADELPHIA,PA??	Y	N.AMERICA	
01/08/91	428	B757	RB211	535E4	2			N						N	YYZ-YVR	XFO	TORONTO OR VANCOUVER	N	N.AMERICA	COMMON PINTAIL DUCK
01/09/91	444	B747	JT9D	7Q	3	8:27	TR	N	0	160			SCLD	ATB	NAN-	NAN	NADI,FIJI	N	PACIFIC	EURASIAN MARSH HARRIER
01/18/91	466	B767	CF6	80C2	1			N						N	BOM-MCT	XFO	BOMBAY OR MUSCAT,OMAN	N		
01/19/91	467	A300	CF6	80C2	1		TR	N	0	V1+				ATB	JFK-	JFK	NEW YORK-JFK,NY	Y	N.AMERICA	HERRING GULL
01/21/91	468	A310	CF6	80C2	1	10:21	DE	N	5380		VFR	BRIGHT	CLEAR	N	-NBO	NBO	NAIROBI,KENYA	N	AFRICA	BLACK KITE
01/22/91	462	B767	CF6	80A	2	11:29	AP	N	610	132			RAIN	N	-TAK	TAK	TAKAMATSU,JAPAN	N	PACIFIC	"KITE-LARGE"
01/22/91	469	A310	CF6	80C2	1	19:00		N						N	-SHA	XFO	SHANGHAI,CHINA??	N		BLACK-CROWNED NITE HERON
01/29/91	463	A310	CF6	80A	1		LD	MESB						N	-CAS	CAS	CASCBLANCA,MOROCCO	N	AFRICA	
01/29/91	463	A310	CF6	80A	2		LD	MESB						N	-CAS	CAS	CASABLANCA,MOROCCO	N	AFRICA	
01/31/91	429	B747	RB211	524G	2			N						N	-LHR	XFO	LONDON-LHR,ENGLAND??	N		
02/04/91	470	A300	CF6	80C2	2	18:00	TR	TRANSVERSE FRAC.	0	139				ATO	HRE-	HRE	HARARE,ZIMBABWE	N	AFRICA	HELMETED GUINEA FOWL
02/13/91	471	A310	CF6	80C2	1	11:52	TR	N	0	V1-				N	MBA-	MBA	MOMBASA,KENYA	N	AFRICA	BLACK-HEADED HERON
02/13/91	499	B757	2000	2040	1			SEMB						N	-PBI	XUS	W.PALM BEACH,FLA??	Y	N.AMERICA	
02/14/91	494	A310	JT9D	7R4D	1		TR	N	0	V1-				ATO		XFO		N		
02/14/91	498	B757	2000	2040	1			N								XUS		Y	N.AMERICA	AMERICAN MOURNING DOVE
02/18/91	500	A320	V2500	A1	2			N							-BOM	XFO	BOMBAY,INDIA??	N		
02/21/91	472	B767	CF6	80C2	2	19:10	DA	N	1500	140				N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	PACIFIC	"MEDIUM"
02/21/91	553	A320	V2500	A1	2	9:27	AP	N		135			NCLD	N	-BLR	BLR	BANGALORE,INDIA	N	ASIA	"KITE"-MEDIUM
02/24/91	455	A320	CFM56	5	2			N						N	-FRA	XFO	FRANKFURT,GERMANY??	N		
02/24/91	473	A310	CF6	80C2	1			N						N	PRG-PRG	PRG	PRAGUE,CZECHOSLAVAKIA	N	EUROPE	
02/26/91	474	A310	CF6	80C2	2	13:21	TR	N	0	160			NCLD	N	DUS-JFK	DUS	DUSSELDORF,GERMANY	N	EUROPE	COMMON LAPWING
02/26/91	475	A310	CF6	80C2	2		TR	N	0	V1+				N	DUS-	DUS	DUSSELDORF,GERMANY	N	EUROPE	
02/27/91	476	B767	CF6	80C2	2			N						N	-OSA	XFO	OSAKA,JAPAN??	N		
03/05/91	456	A320	CFM56	5	1	8:10	AP	N	400	138			NCLD	N	-AMS	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	COMMON WOOD PIGEON
03/05/91	457	A320	CFM56	5	2		TR	N	0	V1+				N	NUE-FRA	NUE	NUREMBERG,GERMANY	N	EUROPE	
03/06/91	477	A300	CF6	80C2	1		CL	N	400					ATB	EWR-SJU	EWR	NEW YORK-NEWARK,NJ	Y	N.AMERICA	HERRING GULL
03/10/91	478	B767	CF6	80C2	1	7:45	LR	N	0	120			NCLD	N	-KMJ	KMJ	KUMAMOTO,JAPAN	N	PACIFIC	"PIGEON-MEDIUM"
03/11/91	479	B767	CF6	80C2	1		TR	N	0	V1+				N	EZE-POA	EZE	BUENOS AIRES-PISTARINI,ARG	N	S.AMERICA	CHIMANGO FALCON
03/13/91	496	B767	JT9D	7R4E	1		TR	POWER LOSS	0					ATO		XFO	AFRICA	N	AFRICA	PEREGRINE FALCON
03/15/91	480	B767	CF6	80C2	1	8:20	AP	N					NCLD	N	-KMJ	KMJ	KUMAMOTO,JAPAN	N	PACIFIC	"MEDIUM"
03/15/91	484	A310	JT9D	7R4E	2		LA	N						N	-SIN	SIN	SINGAPORE	N	PACIFIC	BLACK KITE
03/16/91	481	B767	CF6	80C2	1			N						N	-CLT	XUS	CHARLOTTE,N.CAROLINA??	Y	N.AMERICA	
03/16/91	501	A320	V2500	A1	1			N								XFO	EUROPE/MIDDLE EAST	N		
03/19/91	464	A310	CF6	80A	2		LR	N	0					N	-PFO	PFO	PAPHOS,CYPRUS	N	MID.EAST	SHORT-EARED OWL
03/19/91	482	B747	CF6	80C2	1		LR	MESB	0					N	-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	"GULL" 18 oz.
03/19/91	482	B747	CF6	80C2	2		LR	MESB	0					N	-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	"GULL" 18 OZ.
03/19/91	482	B747	CF6	80C2	3		LR	MESB	0					N	-HND	HND	TOKYO-HND,JAPAN	N	PACIFIC	"GULL" 18 OZ.
03/19/91	493	B767	4000	4060	2		TR	N	0	VR				ATB	BKK-AHU	BKK	BANGKOK,THAILAND	N	PACIFIC	COMMON BARN OWL
03/24/91	458	A320	CFM56	5	2		TR	N	0	V1+				N	LEJ-FRA	LEJ	LEIPZIG,GERMANY	N	EUROPE	
03/25/91	483	B747	CF6	80C2	2	19:00	TR	SEMB	0	165		DUSK	CLEAR	ATB	AMS-MNL	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	"DUCK"-MEDIUM
04/02/91	502	A320	CFM56	5	1			N						N	-NCE	XFO	NICE,FRANCE??	N		
04/03/91	538	A310	CF6	80C2	1		DA	N						N	-BKK	BKK	BANGKOK,THAILAND	N	PACIFIC	
04/03/91	539	B767	CF6	80C2	2			N						N	-OSA	XFO	OSAKA,JAPAN??	N		
04/07/91	540	A300	CF6	80C2	2	8:30	CL	N						ATB	CCS-MIA	CCS	CARACAS,VENEZUELA	N	S.AMERICA	TURKEY VULTURE
04/08/91	503	A320	CFM56	5	1			N						N	-CDG	XFO	PARIS-CDG,FRANCE??	N		
04/09/91	541	B767	CF6	80C2	1	7:00		N			VFR	BRIGHT	CLEAR	N	-SEL	SEL	SEOUL,KOREA	N	ASIA	COMMON SKYLARK
04/11/91	542	B747	CF6	80C2	4		LD	N				OVRCST	CLEAR	N	SIN-NRT	NRT	TOKYO-NRT,JAPAN	N	PACIFIC	SPOT-BILLED DUCK
04/15/91	504	A320	CFM56	5	1		LR	N	0					N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	
04/15/91	525	B767	CF6	80A	1		CL	N						N	REC-FOR	REC	RECIFE,BRAZIL	N	S.AMERICA	
04/16/91	526	B767	CF6	80A	2	16:04	AP	N	500	125			NCLD	N	-KCZ	KCZ	KOCHI,JAPAN	N	PACIFIC	"SPARROW"-SMALL
04/18/91	527	B767	CF6	80A	1		DA	N						N	-BOS	BOS	BOSTON,MASS.	Y	N.AMERICA	
04/20/91	505	A320	CFM56	5	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N		
04/27/91	506	A320	CFM56	5	2	12:39	AP	N	1500	150				N	-NAP	NAP	NAPLES,ITALY	N	EUROPE	"COMMON SWIFT-SMALL"
04/29/91	507	A320	CFM56	5	2			N						N	-TLS	XFO	TOULOUSE,FRANCE??	N		
04/29/91	543	A310	CF6	80C2	1			N						N	SIN-PRG	XFO	SINGAPORE OR PRAGUE	N		COMMON SKYLARK
04/30/91	508	A320	CFM56	5	2			N						N	-VCE	XFO	VENICE,ITALY??	N		
05/01/91	544	B747	CF6	80C2	2	17:00	TR	N	0	V1+	VFR	BRIGHT	CLEAR	N	CDG-NRT	CDG	PARIS-CDG,FRANCE	N	EUROPE	BLACK-HEADED GULL
05/02/91	509	A320	CFM56	5	2		TR	N	0	130				ATO	ORY-	ORY	PARIS-ORLY,FRANCE	N	EUROPE	
05/06/91	545	A310	CF6	80C2	1		TR	N	0	V1+			CLEAR	N	NBO-LHR	NBO	NAIROBI,KENYA	N	AFRICA	
05/07/91	809	B747	CF6	80C2	4			N						N	-MWH	XXX	MOSES LAKE,WASH.??	U		
05/08/91	528	A310	CF6	80A	1		LD	N						N	-IST	IST	ISTANBUL,TURKEY	N	MID.EAST	
05/08/91	810	B747	CF6	80C2	1			N						N	-MWH	XXX	MOSES LAKE,WASH.??	U		
05/09/91	510	A320	CFM56	5	1			N						N	-CDG	XFO	PARIS-CDG,FRANCE??	N		
05/13/91	546	A310	CF6	80C2	2			N						N	-LIS	XFO	LISBON,PORTUGAL??	N		
05/14/91	511	A320	CFM56	5	2			N						N	-HAJ	XFO	HANOVER,GERMANY??	N		
05/14/91	529	B767	CF6	80A	2			N						N	-ZRH	XFO	ZURICH,SWITZERLAND??	N		
05/17/91	530	B767	CF6	80A	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N		
05/22/91	512	A320	CFM56	5	1	10:39	CL	N	1200	160			NCLD	DIV	SXB-	SXB	STRASBOURG,FRANCE	N	EUROPE	COMMON BUZZARD
05/27/91	513	A320	CFM56	5	1		TR	N	0	V1+				ATB	TUN-DJE	TUN	TUNIS,TUNISIA	N	AFRICA	
05/27/91	547	A310	CF6	80C2	1	6:40	TR	N	0	115	VFR	DAWN	CLEAR	ATO	NBO-	NBO	NAIROBI,KENYA	N	AFRICA	BLACK-HEADED HERON
05/30/91	514	A320	CFM56	5	1	9:05	TR	N	0	V1-			NCLD	N	HAM-FRA	HAM	HAMBURG,GERMANY	N	EUROPE	"SMALL"
05/30/91	548	MD11	CF6	80C2	3			N						N	-DFW	XUS	DALLAS-DFW,TEXAS??	Y	N.AMERICA	
05/31/91	515	A320	CFM56	5	1			N						N	-HAM	XFO	HAMBURG,GERMANY??	N		"HAWK"
05/31/91	549	B747	CF6	80C2	1			N						N	SIN-NRT	XFO	SINGAPORE OR TOKYO-NRT	N	PACIFIC	

BIRDNAME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	VIBE	IFSD	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	NMS	F	REMARKS	EVT
COMMON BARN OWL	1S2	1	11	N	1	N		N																	Y	2		4 FB DMG. RPLCD. TYPE DMG??	420
RING-BILLED GULL	14N12	2	17	Y	FL	N		N					Y		Y											2		4FB DMGD.RUBSTRP.INVSTGTD.1 BIRD TO CORE	446
SUSPECT "SEAGULL"	TBI	2			FL	N	HEAVY	N					Y				Y									2		5FB CRACKED.36 FB,2 OGV,2 ACC PAN RPLCD	402
		1				N		N																		0		BIRD INTO CORE	421
BLACK KITE	3K28	1	28			N		N																	Y	1		UNK FB DMG,6FB RPLCD.TYPE DMG??	422
RING-BILLED GULL	14N12	7	17	Y	FL	SURGE		N	Y			Y	Y		Y	Y	Y				Y					2		SURGE/RECVD.20FBDMG,8PCS BRKOUT.	448
RING-BILLED GULL	14N12	1	17	Y	FL	SURGE		N	Y	Y																1		3FB LE DEF.BIRD THRU CORE.SURGE/RCVD	448
HERRING GULL	14N14	1	40	N		U	HIGH	N							Y											2		6SETS FB RPLCD.TIP DMG.VOL PWR RED.VIBES	451
		1			FL	N		N	Y																	1		2FB LE DIST.	459
		1				N		N																		0			460
RUFOUS-BREASTED SWALLOW	18Z55	>1	1		N	N		N																		0		BIRD REMAINS 1ST STAGE STATORS.	452
		1				N		N																		0		GRD. INSP. AT TYO	461
		1				N		N	Y			Y														1		3 FB SHNGLD, 2FB LE BE, 3 SETS RPLCD.	465
COMMON PINTAIL DUCK	2J95	1	30			N	N	N																		0		POST FLIGHT CHECK	428
EURASIAN MARSH HARRIER	3K75	1	23	N	1	N	INC	N					Y	Y			Y									2		3 BROKEN FB'S.ENGINE & NOSECOWL RPLCD	444
		1				N		N	Y																	1		4 FB LE DIST. 4 SETS RPLCD.	466
HERRING GULL	14N14	1	40			N		N	Y				Y				Y							Y		2		5.4"4 IN FRAGMNT. OGV DMG. F. CASE PEN.	467
BLACK KITE	3K28	1	28			N		N																		0		BIRD HIT SPLITTER. SOME INTO CORE	468
"KITE-LARGE"		1				N		N	Y			Y														1		1 FB OUT OF LIMIT,2FB SHINGLED,7FB RPLCD	462
BLACK-CROWNED NITE HERON	1I24	1	24			N		N																		0		GRD. INSP. SHANGHAI	469
		1				N		N																		0		GRD. INSP. AT CAS.	463
		1				N		N																		0			463
		1				N	N	N					Y													1		INFILL & ACOUSTIC PNL.DMG.	429
HELMETED GUINEA FOWL	5L3	1	52			90%		N	Y								Y	Y								2	*	4 FB DMGD, 58of69 KEVLAR LAYERS PENTRD.	470
BLACK-HEADED HERON	1I59	1	38			N	2.6	N	Y																	1		4 FB LE., BIRD INTO CORE.	471
		2				N		N																		0		CREW UNAWARE.BIRD INTO CORE.	499
		1				N		N						Y										Y		1		THRUST REV DAMAGE,	494
AMERICAN MOURNING DOVE	2P105	1	4			N	N	N																		0		INTO CORE	498
		1				N		N					Y													1		OUTSIDE SHROUD.ACOUSTIC PANEL DMG	500
"MEDIUM"		1				N		N																		0			472
"KITE"-MEDIUM		1		N	SE	N		N					Y													1		ACOU.PANEL HOLES.FAN SHROUD HONEYCOMB.	553
		1				N		N																		0		GRD. INSP.	455
		1		N		N		N	Y																	1		3 FB MINOR NICKS,BLENDABLE,TOUCH&GOS	473
COMMON LAPWING	5N1	1	8	N	FL	N		N									Y								Y	2		6 FB. DMGD, 6"8 CM PIECE PEN. NOSE COWL.	474
		1				N		N	Y																	1		2 FB LE. BLENDABLE.	475
		1				N		N																		0		GRD. INSP.	476
COMMON WOOD PIGEON	2P9	1	18	N	SE	N		N																		0		FINAL APPROACH AMS	456
	TBI	1				N	6.3	N	Y	Y							Y									2		HARD FOD TO 1FB FROM FRAGS.OF 2 OTHER FB	457
HERRING GULL	14N14	1	40		SE	SURGE	INC	N	Y				Y		Y											2		13FB LE TIPCURL,BANG,FLMS,4TIRES,ENGRMVD	477
"PIGEON-MEDIUM"		1		N		N		N													Y					2		5X5.25mm MISSNG LE TIP S1 HPC BL.ENG CHG	478
CHIMANGO FALCON	5K8	1	12		1	N		N																Y		1		3 OGV'S REPLACED	479
PEREGRINE FALCON	5K59	1	22			NR SURGE,HI EGT		N																		2	*	NON-RECOV.SURGE,HIEGT.	496
"MEDIUM"		1		N		N		N																		0		BSI'D.NO DMG.	480
BLACK KITE	3K28	1	28	N	N	N		N				Y			Y											2		4FB BE TIPS.PILOT UNAWARE OF STRIKE.	484
		1			N	N		N	Y																	L		1 FB LE WITHIN LIMITS	481
		1				N		N																		0		EUROPE OR MIDDLE EAST	501
SHORT-EARED OWL	2S124	1	13			N		N																		0		STRUCK MIDSTREAM SHROUD AREA	464
"GULL" 18 oz.		1				N		N																		0		3 ENG. ING.	482
"GULL" 18 OZ.		1				N		N																		0		3 ENG. ING.	482
"GULL" 18 OZ.		1				N		N																		0		3 ENG. ING.	482
COMMON BARN OWL	1S2	1	12			SURGE	INC	N																		S		BANG,FLAMES,VIBES,INC EGT. AT ROTATION.	493
		1		U		N		N	Y															Y		1		2 FB LE DIST, 6 OGV'S RPLCD	458
"DUCK"-MEDIUM		>1		N	1	N	5.0	N								Y	Y				Y					2		8 FB TORN TIPS, METAL MISSING, HPC DMG	483
		1				N	5.0	N																	Y	1		2 FB DMGD. FAN SET RPLCD	502
		1				N		N																		0		DESC/APP INTO BKK.FAN HIT 12 O'CLOCK.	538
		1				N		N																		0		GRD INSP AT OSA.POSSIBLE US?	539
TURKEY VULTURE	1K1	1	52		1	SURGE	INC	N					Y	Y			Y							Y	Y	2		BANG.5 OGV,7FB DMGD.2FB PIECES MISSING.	540
		1				N		N																		0		GRD INSP, CREW UNAWARE	503
COMMON SKYLARK	17Z72	1	2			N		N																		0		INTO LPC INLET(CORE)	541
SPOT-BILLED DUCK	2J91	1	40	N		N		N																		0		HIT OGV'S,FB'S,INLT COWL,SPINNR,VBV PORT	542
		1			Y	N		N																		0		CREW REPORTED BIRD INGESTION	504
		1				N	2.3	N	Y																	1		3 FB IMPACT DISTORTION,RPLCD.	525
"SPARROW"-SMALL		1		N		N		N																		0		GRD INSP KOCHI, JAPAN	526
		1				N		N																		0		DES/APP TO LOGAN.HIT NOSE COWL,ACOU.PNLS	527
		1			Y	N		N																		0		PILOT AWARE OF STRIKE	505
"COMMON SWIFT-SMALL"		1		N	SE	N		N																		0		FLIGHT DELAY DUE TO ENGINE INSPECTION.	506
		1				N		N																Y		1		1 OGV RPLCD. TRAINING FLIGHT	507
COMMON SKYLARK	17Z72	1	2			N		N																		0		HIT FAN CASE, SPINNER	543
		1				N		N																		0		FOUND AT GRD INSP	508
BLACK-HEADED GULL	14N36	1	10		SE	N	3.5	N					Y											Y	Y	2		4 FB,T1.2 SENSOR(ALFA),ACOU.LINER DMGD.	544
		1				N		N																		0		LOUD NOISE, ODOR	509
		1				N		N	Y				Y											Y		1		2FB LE,4 OGV'S RPLCD.2"HOLE ACOU.LINER	545
		1				N		N																		0		ENG REMOVED 1/23/92-HPC DAMAGE.	809
		1				N		N																		1		4 FB MIDSPAN SHROUDS OUT OF ALIGNMENT.	528
		1				N		N																		0			810
		1				N		N																		0		GRD INSP AT CDG	510
		1				N		N		Y																1		1 FB BE AT TIP	546
		1				N		N																		0		GRD INSP AT HANOVER, GERMANY	511
		1				N		N																		0		WALKAROUND AT ZRH.	529
		1				N		N																		0			530
COMMON BUZZARD	3K180	1	32	N	1	N	0.7	N	Y						Y											2		4 FB OUT OF LIMITS.FAN SET RPLCD.	512
		1				Y	HIGH	VIBES	Y			Y														2		9 FB DEFORM.& SHINGLING	513
BLACK-HEADED HERON	1I59	1	38			N	INC	N	Y								Y									2		6FB DMGD,5FB LE DIST,1FB 2"PIECE MISSING	547
"SMALL"		1		N		N		N																		0		ODOR IN COCKPIT	514
		1				N		N													Y					2		MASSIVE HPC BLD.FRAGMENTATION.ENG FAIL?	548
"HAWK"		1			N	N		N																		0		GRD INSP HAM	515
		1				N		N	Y																	1		1 FB LE DIST, RPLCD	549

DATE	EVT	A/C	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	FLR	LTCON	WEATHER	CREW	CITYPRS	APT	LOCALE	US	REGION	BIRDNAME
06/03/91	550	B767	CF6	80C2	1			MESB						N	-NRT	XFO	TOKYO-NRT,JAPAN??	N		
06/03/91	550	B767	CF6	80C2	2			MESB						N	-NRT	XFO	TOKYO-NRT,JAPAN??	N		
06/08/91	531	A310	CF6	80A	1	0:15	LR	N	0			DARK		N	FRA-ESB	ESB	ANKARA-ESENBOGA,TURKEY	N	MID.EAST	
06/08/91	551	A300	CF6	80C2	2			N						N	-JFK	XUS	NEW YORK-JFK,NY??	Y	N.AMERICA	
06/09/91	516	A320	CFM56	5	1		TR	N	0	V1+				N	CDG-DUB	CDG	PARIS-CDG,FRANCE	N	EUROPE	
06/11/91	517	A320	CFM56	5	2			N						N	-YEG	XFO	EDMONTON,CANADA??	N		
06/14/91	518	A320	CFM56	5	2		TR	N	0	V1+				N	ABZ-LHR	ABZ	ABERDEEN,SCOTLAND,UK	N	EUROPE	
06/15/91	532	B767	CF6	80A	1			N						N	-ORD	XUS	CHICAGO-ORD,ILL??	Y	N.AMERICA	
06/16/91	533	A310	CF6	80A	2	1:15	AP	N	500			DARK		N	-FRA	FRA	FRANKFURT,GERMANY	N	EUROPE	COMMON SWIFT
06/17/91	534	A310	CF6	80A	1		RV	N	0					N	-FNA	FNA	FREETOWN,SIERRA LEONE	N	AFRICA	
06/19/91	535	B767	CF6	80A	1	8:45	AP	N	100	132			OVERCAST	N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	PACIFIC	"SMALL"
06/19/91	552	B767	CF6	80C2	1	8:45	AP	N	50	135			RAIN	N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	PACIFIC	"SMALL"
06/22/91	519	A320	CFM56	5	2			N						N	-LHR	XFO	LONDON-LHR,UK??	N		
06/22/91	520	A320	CFM56	5	2	10:10	TO	N	20	160			NCLD	N	-ORY	XFO	FRANCE??	N		"KITE/EAGLE/HAWK"-MEDIU
06/23/91	536	A310	CF6	80A	1		LR	MESB	0					N	-FRA	FRA	FRANKFURT,GERMANY	N	EUROPE	
06/23/91	536	A310	CF6	80A	2		LR	MESB	0					N	-FRA	FRA	FRANKFURT,GERMANY	N	EUROPE	
06/25/91	521	A320	CFM56	5	2		DA	N						N	-MYJ	XFO	MATSUYAMA,JAPAN??	N		
06/27/91	522	A320	CFM56	5	2			N						N	-NTE	XFO	NANTES,FRANCE??	N		
06/29/91	523	A320	CFM56	5	2			N						N	-YUL	XFO	MONTREAL,CANADA??	N		
06/29/91	537	A310	CF6	80A	1	4:30	LD	N	10					N	-LEJ	LEJ	LEIPZIG,GERMANY	N	EUROPE	
06/30/91	524	A320	CFM56	5	2		TO	N						N	ORY-	ORY	PARIS-ORLY,FRANCE	N	EUROPE	COMMON WOOD PIGEON
07/02/91	555	A320	CFM56	5	1			N						N	-CDG	XFO	PARIS-CDG,FRANCE??	N		
07/07/91	578	B767	CF6	80C2	2			N						N	-MYJ	XFO	MATSUYAMA,JAPAN??	N		
07/09/91	579	B767	CF6	80C2	2		CL	N	1000					ATB	YVR-	YVR	VANCOUVER,CANADA	N	N.AMERICA	HERRING GULL
07/16/91	556	A320	CFM56	5	1			N						N	-MSP	XUS	MINEAPOLIS,MINN??	Y	N.AMERICA	
07/16/91	557	A320	CFM56	5	2		TR	N	0	V1-				N	ORY-	ORY	PARIS-ORLY,FRANCE	N	EUROPE	EURASIAN KESTREL
07/16/91	580	B767	CF6	80C2	2			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N		
07/19/91	558	A320	CFM56	5	1		DA	N						N	-LHR	LHR	LONDON-LHR,ENGLAND,UK	N	EUROPE	
07/20/91	581	B767	CF6	80C2	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N		LEAST TERN
07/20/91	582	A300	CF6	80C2	2	8:00	LR	N	0	110			RAIN	N	DXB-BOM	BOM	BOMBAY,INDIA	N	ASIA	"CROW"-MEDIUM
07/21/91	559	A320	CFM56	5	1	20:55	LD	MESB	50	135			NCLD	N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	HERRING GULL
07/21/91	559	A320	CFM56	5	2	20:55	LD	MESB	50	135			NCLD	N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	HERRING GULL
07/21/91	563	A320	CFM56	5	1	20:04	LD	MESB	30	135			NCLD	N	-FCO	FCO	ROME-DA VINCI,ITALY	N	EUROPE	BLACK-HEADED GULL
07/21/91	563	A320	CFM56	5	2	20:04	LD	MESB	30	135			NCLD	N	-FCO	FCO	ROME-DA VINCI,ITALY	N	EUROPE	BLACK-HEADED GULL
07/22/91	560	A320	CFM56	5	1		TR	N	0	V1+				N	DUS-FRA	DUS	DUSSELDORF,GERMANY	N	EUROPE	
07/22/91	561	A320	CFM56	5	1	18:20	LR	N	0	140			CLEAR	N	-MLH	MLH	MULHOUSE/BASEL,FRANCE	N	EUROPE	
07/22/91	583	B767	CF6	80C2	1			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N		
07/22/91	823	A320	CFM56	5	2	7:05	TR	N	0	090			CLOUDS	N	NUE-FRA	NUE	NUREMBERG,GERMANY	N	EUROPE	"FALCON-MEDIUM"
07/24/91	562	A320	CFM56	5	2		TR	N	0	V1+				ATB	SAP-	SAP	SAN PEDRO,SULA,HONDURAS	N	S.AMERICA	
07/24/91	585	B747	CF6	80C2	1	15:58	LR	N	0	110			OVERCAST	N	-AXT	AXT	AKITA,JAPAN	N	PACIFIC	"KITE-MEDIUM"
07/25/91	584	B767	CF6	80C2	2			N						N	-TYO	XFO	TOKYO-TYO,JAPAN??	N		
07/26/91	571	A310	CF6	80A	2		RV	N	0					N	-PMO	PMO	PALERMO,ITALY	N	EUROPE	COMMON ROCK DOVE
07/26/91	586	B767	CF6	80C2	2	12:20	TR	N	0	124			OVERCAST	N	SDJ-	SDJ	SENDAI,JAPAN	N	PACIFIC	"KITE"-LARGE
07/27/91	587	B747	CF6	80C2	3		CL	N						N	CDG-LHR	CDG	PARIS-CDG,FRANCE	N	EUROPE	COMMON WOOD PIGEON
07/29/91	564	A320	CFM56	5	2	14:30	LR	N	0					N	-LIN	LIN	MILAN-LIN,ITALY	N	EUROPE	
07/29/91	565	A320	CFM56	5	1	19:45	AP	MESB	50	140			NCLD	N	-FCO	FCO	ROME-DA VINCI,ITALY	N	EUROPE	GREAT BLACK-BACKED GUL
07/29/91	565	A320	CFM56	5	2	19:45	AP	MESB	50	140			NCLD	N	-FCO	FCO	ROME-DA VINCI,ITALY	N	EUROPE	GREAT BLACK-BACKED GUL
07/30/91	572	A310	CF6	80A	1			N						N	-AMS	XFO	AMSTERDAM,NETHERLANDS??	N		
07/31/91	588	A310	CF6	80C2	1			N						N	-IST	XFO	ISTANBUL,TURKEY??	N		
08/04/91	566	A320	CFM56	5	1	10:50	TO	N	30	140			OVERCAST	N	BRE-FRA	BRE	BREMEN,GERMANY	N	EUROPE	"GULL" 18 oz.
08/04/91	567	A320	CFM56	5	1		AP	MESB						N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	
08/04/91	567	A320	CFM56	5	2		AP	MESB						N	-CDG	CDG	PARIS-CDG,FRANCE	N	EUROPE	
08/06/91	589	A310	CF6	80C2	2		AP	N						N	-IST	IST	ISTANBUL,TURKEY	N	MID.EAST	
08/07/91	590	B767	CF6	80C2	1		TO	SEMB		V1+				ATB	YYC-	YYC	CALGARY,CANADA	N	N.AMERICA	
08/11/91	573	B767	CF6	80A	1		TR	MESB	0	110				ATO	TAK-	TAK	TAKAMATSU,JAPAN	N	PACIFIC	
08/11/91	573	B767	CF6	80A	2		TR	MESB	0	110				ATO	TAK-	TAK	TAKAMATSU,JAPAN	N	PACIFIC	
08/11/91	591	B747	CF6	80C2	1			N						N	-IAD	XXX	WASHINGTON-DULLES,VA??	U		
08/16/91	568	A320	CFM56	5	1		AP	N						N	CDG-NCE	NCE	NICE,FRANCE	N	EUROPE	
08/16/91	575	B767	CF6	80A	1	12:53	AP	N	100	134			NCLD	N	-MAN	MAN	MANCHESTER,ENGLAND,UK	N	EUROPE	
08/18/91	592	B767	CF6	80C2	2			N						N	-AUH	XFO	ABU DHABI,UA EMIRATES??	N		
08/21/91	576	B767	CF6	80A	1	15:07	LR	N	0	130			OVERCAST	N	-AXT	AXT	AKITA,JAPAN	N	PACIFIC	"KITE"-MEDIUM
08/25/91	569	A320	CFM56	5	2		AP	N						N	-FCO	FCO	ROME-DA VINCI,ITALY	N	EUROPE	
08/26/91	593	B747	CF6	80C2	4			N						N	AMS-NRT	XFO	AMSTERDAM OR TOKYO-NRT	N		
08/27/91	570	A320	CFM56	5	2	17:50	TR	N	0					N	ORY-	ORY	PARIS-ORY,FRANCE	N	EUROPE	CORN BUNTING
08/29/91	577	A310	CF6	80A	2		TR	N	0	V1-				N	HAM-FRA	HAM	HAMBURG,GERMANY	N	EUROPE	
08/29/91	594	B747	CF6	80C2	4		TR	N	0	V1+				N	AMS-SIN	AMS	AMSTERDAM,NETHERLANDS	N	EUROPE	
08/29/91	645	B767	CF6	80C2	1			N						N	-PER	XFO	PERTH,AUSTRALIA??	N		

RDNAME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	VIBE	IFSD	A B C D E	F G H I J	K L M N O	P Q	NMS F	REMARKS	EVT
		1				N		N					0	GRD INSP NRT	550
		1				N		N					0	GRD INSP NRT	550
		1				N		N					0	STAINS IN FAN AREA	531
		1				N		N				Y	1	1 FB UNK DMG, RPLCD	551
		1				N		N					0		516
		1				N		N					0	WALKAROUND AT YEG	517
		1			Y	N		N					0	CREW REPORTED INGESTION DURING TAKEOFF.	518
		1				N		N				Y	1	2 FB UNK DMG, RPLCD.	532
MMON SWIFT	1U55	1	1.5			N		N					0	FINAL APPROACH	533
		1				N		N	Y			Y	2	THRUST REVERSAL.6FB UNK DMG.	534
ALL"		1		N		N		N					0		535
ALL"		1		N	FL	N		N					0	GRD INSP MYJ	552
		1				N		N					0	GRD INSP AT LHR	519
E/EAGLE/HAWK"-MEDIUM		1		N		N	7.2	N	Y	Y			2	7 FB OUT OF LIMITS. FAN SET RPLCD	520
		1				N		N					0	STAINS IN FAN & CORE INLET	536
		1				N		N					0	BLOOD IN FAN & CORE INLET	536
		1				N		N					0	STRIKE REPORTED EN ROUTE TO MYJ. CRUISE?	521
		1				N		N	Y				1	2 FB LE TIP CURL. RPLCD AT ORLY	522
		1				N		N				Y	1	2 FB UNKNOWN DMG.-RPLCD.	523
		1				N		N					0	JUST BEFORE TOUCHDOWN	537
MMON WOOD PIGEON	2P9	1	18			N		N				Y	1	3 FB UNKNOWN DMG, FAN SET RPLCD	524
	TBi	1				N		N					0	FEATHERS BOOSTER INLET & FAN OGV'S	555
		1				N		N					0	BIRD INTO CORE	578
RRING GULL	14N14	1	40			Y	5.5	VIBES	Y Y	Y Y		Y	2	8 OGV,7FB DMG.1FB PIECE BREAK.	579
		1				N		N	Y			Y	1	1FB LE TIP CRL.2FB MDSPN.SHRD.HRDCOATDMG	556
RASIAN KESTREL	5K272	1	7			N		N					0		557
		1				N		N					0		580
	TBi	1				N	N	N					0	DESC/APP INTO LHR FEATHER IN FAN OGV'S	558
ST TERN	14N74	1	1.6			N		N			Y		2	PIECES MISSING STG 1 HPC BLADE	581
OW"-MEDIUM		1		N	SE	N		N		Y		Y	1	BLOCKER DOOR DMGD.(FAN REVERSER)	582
RRING GULL	14N14	1	40	N	FL	N		N					0	BIRDS HIT ENGS,WING,FUSELAGE,LDG GEAR	559
RRING GULL	14N14	1	40	N	FL	N		N					0	SEE ENG POS 1	559
CK-HEADED GULL	14N36	1	10		FL	N		N	Y		Y	Y	1	7 OGV FAIRINGS BRKN.1HPC S1 BL TIP CURL	563
CK-HEADED GULL	14N36	1	10		FL	N		N					0	100+ BIRDS SEEN.	563
		1				N	7.0	N	Y			Y	1	2 FB UNK DMG & SHINGLED. 2PR FB RPLCD	560
		1		N		N		N					0		561
		1				N		N			Y		2	HPC STG1:2 BL PIECES BKN.5BL TE CRACKS	583
CON-MEDIUM"		1		N		N		N					0		823
		1				N		N				Y Y	2	5 FB UNK DMG, 5 PR RPLCD, 11 OGV'S DMG	562
E-MEDIUM"		1		N		N		N			Y		2	SEVERAL HPC BLADES DAMAGED(OF UNK.TYPE)	585
		1				N		N			Y		2	IGV DMG,UNK HPC DMG,ENG REMOVED	584
MMON ROCK DOVE	2P·	1	14			N		N	Y Y				1	3FB DEF.3-5CM.5PR FB RPLCD.ABB SHRD DMGD	571
E"-LARGE		1		N		N	INC	N	Y			Y	1	3 FB LE BE.MIDSPAN SHROUD DMGD.	586
MMON WOOD PIGEON	2P9	1	18		1	Y	5	N	Y Y Y	Y		Y	2	4FB LE TIP CURL.IFB BKN PIECE.OGV LE DMG	587
	TB·	1		N		N		N					0	NO ABNORMAL ENGINE BEHAVIOR	564
EAT BLACK-BACKED GULL	14N21	1	60	N	FL	N		N	Y			Y	1	1 OGV OUTER FAIRING BRKN.2FB SHRD SHNGLD	565
EAT BLACK-BACKED GULL	14N21	1	60	N	FL	N		N			Y		1	1 BOOSTER IGV NICKED WITHIN LIMITS.	565
		1				N		N	Y Y				1	MINOR FB DISTORT.2 ACCOUSTIC PANLS RPLCD	572
		1				N		N		Y			1	30 SQ.IN.OF INLET COWL DMGD.COWL REMOVED	588
L" 18 oz.		1		Y	1	N	N	N				Y	1	3 FB UNK DMG, RPLCD.	566
		1				N	N	N					0	FINAL APPROACH	567
		1				N	N	N					0	FINAL AP.1 HPC BL TIP CURL, SERVICABLE	567
		1				N		N				Y	1	3 FB UNK DMG.,REPLACED	589
		3-4				5%	INC	VIBES	Y Y			Y	2	3FB LE TIP BE.1 OGV BKN.PWLOSS.1IN CORE?	590
		1			Y	N		N					0		573
		1			Y	N		N					0		573
		1				N		N					0	BIRD DIDN'T ENTER CORE INLET	591
		1				N	N	N					0	FINAL APPROACH NCE	568
		1			SE	N	N	N	Y				1	3 FB SHINGLED.ICAO HAS 9FB DMGD	575
		1				N		N	Y		Y		2	HPC STG1 LE DMG.MDSPN SHRD SHGLD.ENGRMVD	592
E"-MEDIUM		1		N		N		N	Y				1	1 FWD.ACCOUSTIC LINER RPLCD.	576
		1				N	N	N					0	FINAL INTO FCO	569
		1				N		N	Y Y				1	1 FB LE SHINGLED.I FB REPLACED	593
N BUNTING	68Z166	1	1.7	N	1	N		N			Y		2	1 BROKEN HPC S6 BL.S1,S5,S9 IMPACT DMG.	570
		1				N	N	N				Y	1	3 FB UNK TYPE DMG	577
		1				N	5	N	Y Y				1	1 FB BE. 2 FB LE TIP CURL. 6 FB RPLCD.	594
		1				N		N					0	BORESCOPED.	645

APPENDIX G

SUMMARY OF ICAO DATA

This appendix summarizes pertinent data from the ICAO Bird Strike Information System (IBIS) that were unreported by the engine manufacturers. Each line of information pertains to a unique "bird strike to an engine". It is unknown, in general, whether a bird ingestion took place. The events are listed chronologically. Unless otherwise specified, "N" denotes "no" or "none" and a "blank" entry means the information is "unknown."

The column headings are defined as follows:

DATE	Date of Occurence
ICAO#	ICAO File Number
A/C	Aircraft Type
REG	Aircraft Registration
ENG	Engine Model
DASH	Engine Model Dash
POS	Engine Position
TIME	Local Time of Occurance
POF	Phase of Flight (TR=takeoff roll, TO=takeoff, CL=climb, DE=descent, AP=approach, LR=landing roll)
SIGEVT	Significant Event (ME=multiple engines, MB=multiple birds)
ALT	Altitude of Aircraft (feet AGL)
SPD	Speed of Aircraft (KIAS)
WEATHER	Weather/Sky Condition (NCLD=no clouds, SCLD=some clouds)
CREW	Crew Action (ATO=aborted takeoff, ATB=precautionary landing)
CITYPRS	Scheduled Departure-Arrival airports
APT	Airport Code
LOCALE	Location of Airport
US	Y=US (50 states), N=Foreign (non-US), U=Unknown
BIRDNAME	Bird Name, Description, or Perceived Size
SPEC	Confirmed Bird Species Code (from [4])
#BDS	Number of birds striking aircraft (See also REMARKS)
WT	Bird Weight (ounces) for Confirmed Species
ALERT	Pilot Warned of Birds
SEE	Number of birds seen
POWLOSS	Power Loss
IFSD	In-Flight Engine Shutdown Reasons
DMG	Damage to Aircraft (1=damage, 0=no damage) - See REMARKS
REMARKS	The Remarks often contain more specific descriptions of damage as well as other pertinent information
ICAO#	ICAO File Number (repeated)

DATE	ICAO#	A/C	REG	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	WEATHER	CREW	CITYPRS	APT	LOCALE	US	BIF
02/24/89	89014610	B757	G-BIKS	RB211	535C	2	7:50	LR		0	115	RAIN	N	-IST	IST	ISTANBUL,TURKEY	N	"GU
03/11/89	90001050	B767		JT9D	7R4D			TR		0		SCLD	N	SNA-	SNA	ORANGE COUNTY,CAL	Y	"DU
03/30/89	89100721	B767	VH-EAK	JT9D	7R4E	2	22:51	LR	MB?	0			N	-TSV	TSV	TOWNSVILLE,AUSTRALIA	N	"LA
04/12/89	89021160	B747	9V-SMA	4000	4056	3	16:12	AP	MB?	600	150		N	-HKG	HKG	HONG KONG	N	"ME
04/17/89	89014110	B757	G-000G	RB211	535E4	1	18:50	AP	ME	75	127	NCLD	N	-PMI	PMI	PALMA,MALLORCA,SPAIN	N	"GU
04/17/89	89014110	B757	G-000G	RB211	535E4	2	18:50	AP	ME	75	127	NCLD	N	-PMI	PMI	PALMA,MALLORCA,SPAIN	N	"GU
04/20/89	89014150	B757	G-BIKV	RB211	535C	2	17:50	AP	N	800	124	SCLD	N	-BRU	BRU	BRUSSELS,BELGIUM	N	
05/14/89	89014380	B767	N605TW	JT9D	7R4D	1	7:57	TR		0		SCLD	N	FRA-	FRA	FRANKFURT,GERMANY	N	
06/14/89	89015260	B757	G-BMRG	RB211	535C	2		TO	N	10	135	NCLD	N	FLR-	FLR	FLORENCE,ITALY	N	"SW
06/15/89	89015290	B757	G-BOZH	RB211	535C	1	17:50	CL		3000	200		N	LHR-	LHR	LONDON-LHR,ENGLAND,UK	N	"SW
06/20/89	89023000	B747	N221GE	JT9D	7R4G2	3	17:26	TR		0	100	NCLD	N	JFK-	JFK	NEW YORK-JFK,NY	Y	"GU
06/30/89	89019530	B747	TJ-CAB	JT9D	7Q	3	21:23		N				N		XFO	GAROUA,CAMEROON??	N	"OW
07/10/89	89021110	A300	B1810	4000	4158	1	12:50	AP		7000	200	NCLD	N	-HKG	HKG	HONG KONG	N	"ME
07/12/89	89102271	B767	ZK-NBD	JT9D	7R4D	2	18:40	AP	N	800			N	-SYD	SYD	SYDNEY,AUSTRALIA	N	"ME
07/21/89	89020100	A310	VT-EJK	CF6	80C2	2	8:40	AP		50	145		N	-BOM	BOM	BOMBAY,INDIA	N	"KIT
07/28/89	89016650	B757	G-MOND	RB211	535E4	1	8:29	LR	MB?	0	160	OVERCAST	N	-VCE	VCE	VENICE,ITALY	N	"SW
08/03/89	89006310	B757	DAMUR?	RB211	535E4	1	20:15	TR		0	110	SCLD	ATO	GRO	GRO	GERONA,SPAIN	N	"ME
08/04/89	89012270	B767	A40-GK	CF6	80C2	1	9:14	AP		500	145	NCLD	N	-BKK	BKK	BANGKOK,THAILAND	N	"SM
08/10/89	89019790	A320	VTEPE	V2500	A1	2	12:45	AP	AIRWORTHY	2500	240	SCLD		-DEL	DEL	DELHI,INDIA	N	"LA
08/11/89	89019520	B747	TJ-CAB	JT9D	7Q	4	19:59	TR	MB	0		NCLD	N	GOU-	GOU	GAROUA,CAMEROON	N	"ME
08/14/89	89002610	B747	TJ-CAS	JT9D	7Q	1			N				N		XFO	FRANCE	N	"BU
08/20/89	89009770	B757	D-AMUY	RB211	535E4	2	8:13	TR	N	0	150	OVERCAST	ATB	HAM-	HAM	HAMBURG,GERMANY	N	"GU
09/10/89	89017560	B757	G-BNSF	RB211	535E4	2	19:10	TR		0	120	SCLD	N		ACA	ACAPULCO,MEXICO	N	
10/05/89	89018030	B767	CGAVC	JT9D	7R4D	2	5:56	AP		250	140	RAIN	N	-PIK	PIK	PRESTWICK,SCOTLAND	N	
11/06/89	89007720	B747	D-ABVB	CF6	80C2	3	10:00	TR	ME	0	145	OVERCAST	N	LHA-	LHA	LAHR,GERMANY	N	"SW
11/06/89	89007720	B747	D-ABVB	CF6	80C2	4	10:00	TR	ME	0	145	OVERCAST	N	LHA-	LHA	LAHR,GERMANY	N	"SW
11/06/89	89018740	B757	G-BMRT	RB211	535C	1	9:30	LR	ME	0	100	FOG	N	-MAN	MAN	MANCHESTER,ENGLAND	N	"BL
11/06/89	89018740	B757	G-BMRT	RB211	535C	2	9:30	LR	ME	0	100	FOG	N	-MAN	MAN	MANCHESTER,ENGLAND	N	"BL
11/27/89	89415150	B767		CF6	80C2	1		AP			250		N	-SCK	SCK	STOCKTON,CALIFORNIA	Y	"CO
12/11/89	89103321	B767	ZK-NBC	CF6	80A	1	22:10	TO	ME	100	150		N	SYD-	SYD	SYDNEY,AUSTRALIA	N	"SIL
12/11/89	89103321	B767	ZK-NBC	CF6	80A	2	22:10	TO	ME	100	150		N	SYD-	SYD	SYDNEY,AUSTRALIA	N	"SIL
12/17/89	89019250	B757	G-BIKD	RB211	535C	1	8:20	TO	N	20	120	FOG	N	LIN-	LIN	MILAN-LIN,ITALY	N	"LA
02/17/90	90016410	A320	F-GHKB	CFM56	5	2	11:07	TR	N	0	100	FOG	N	ORY-	ORY	PARIS-ORY,FRANCE	N	
02/26/90	90042300	B757	22193	RB211	535E4	2		DE	AIRWORTHY	10000				-ATL	ATL	ATLANTA,GA.	Y	
03/17/90	89025270	B747	HBIGC	JT9D	7R4G2	2	12:59	CL		1400	145	OVERCAST	N	ZRH-	ZRH	ZURICH,SWITZERLAND	N	"ME
04/20/90	90006370	B747	HBIGD	JT9D	7R4G2	1	18:27	AP		10	135	SCLD	N	-ZRH	ZRH	ZURICH,SWITZERLAND	N	"HE
05/03/90	90016700	A310	F-GEMB	CF6	80A	2		AP		10	135	SCLD	N	-CMN	CMN	CASABLANCA,MOROCCO	N	"SM
05/10/90	90005903	B747	HBIGD	JT9D	7R4G2	3	18:53	CL		700	165	NCLD	N	SEL-	SEL	SEOUL,KOREA	N	
05/26/90	90005570	B757	D-AMUV	RB211	535E4	1	10:03	TO	N	100	150	NCLD	N	???-	???	TANIA,ITALY	N	"SM
05/28/90	90011250	B757	G-BIKB	RB211	535C	2	18:30	TO	N	10	140	NCLD		CPH-	CPH	COPENHAGEN,DENMARK	N	"GU
06/28/90	90002270	A320	D-AIPB	CFM56	5	2	18:35	TR		0	150	SCLD	N	BRE-	BRE	BREMEN,GERMANY	N	"GU
07/04/90	90026080	B767	A40-GF	CF6	80C2	1			ME			SCLD	N		XXX		U	
07/04/90	90026080	B767	A40-GF	CF6	80C2	2			ME			SCLD	N		XXX		U	
07/16/90	90001870	A320	D-AIPD	CFM56	5	2	11:23	AP	N	500	140	NCLD	N	-FRA	FRA	FRANKFURT,GERMANY	N	"SM
07/20/90	91020290	B747	JA8289	CF6	80C2	1	11:52	LR	N	0	130	RAIN	N	-AXT	AXT	AKITA,JAPAN	N	"SM
08/07/90	90022840	B767	ZK-???	CF6	80?	1	9:19	LR		0	130	SCLD	N	-WLG	WLG	WELLINGTON,NEW ZEALAND	N	"GU
08/28/90	90009210	B747	PH-BFE	CF6	80C2	3	12:00	TR	ME	0		SCLD	N	ANC-	ANC	ANCHORAGE,ALASKA	Y	
08/28/90	90009210	B747	PH-BFE	CF6	80C2	4	12:00	TR	ME	0		SCLD	N	ANC-	ANC	ANCHORAGE,ALASKA	Y	
09/04/90	90001400	A310	D-AHLW	CF6	80C2	2		AP				NCLD	N	-PMI	PMI	PALMA,MALLORCA,SPAIN	N	"SM
09/24/90	90014390	B757	G-OOOI	RB211	535E4	2	16:05	LR		0	15	NCLD	N	-MIR	MIR	MONASTIR,TUNISIA	N	
09/25/90	90014410	B757	G-BMRI	RB211	535C	1	10:00	AP		50		SCLD	N	-MAN	MAN	MANCHESTER,ENGLAND	N	BLA
09/26/90	90001330	B757	D-AMUW	RB211	535E4	1	11:19	TR	N	0	140	SCLD	N	MLA-	MLA	MALTA	N	"SM
10/04/90	90017900	A320	F-GHQD	CFM56	5	2	10:25	AP	N			NCLD	N	-LRT	LRT	LORIENT,FRANCE	N	"SM
10/09/90	90027760	B747	ZSSAT	JT9D	7R4G2	2		LR		0	135	NCLD	N	-WDH	WDH	WINDHOEK,NAMIBIA	N	
10/18/90	90027750	B747	ZSSAL	JT9D	7R4G2	3		AP		350	137	NCLD	N	-DUR	DUR	DURBAN,S.AFRICA	N	"SM
10/22/90	90027040	A310	H-STIC	CF6	80C2	2	1:38	AP		10	139	NCLD	N	-CNX	CNX	CHIANG MAI,THAILAND	N	"ME
11/05/90	90018120	A320	F-GHQE	CFM56	5	2		AP				NCLD	N	-BIQ	BIQ	BIARRITZ,FRANCE	N	"CO
11/08/90	90405200	A300		CF6	80C2	1		AP				NCLD	N	-JFK	JFK	NEW YORK-JFK,NY	Y	
11/19/90	90026710	B767	OY-KDI	4000	4060	2	19:07	TR		0	130	NCLD	N	EWR-	EWR	NEWARK,NJ	Y	"ME
12/09/90	90104431	B747	VH-OJH	RB211	524G	1	19:51	TO	MB?	200	200		N	AKL-	AKL	AUKLAND,NEW ZEALAND	N	
01/07/91	91018910	B767	JA8489	CF6	80A	2						NCLD		-TOY	XFO	TOYAMA,JAPAN??	N	
01/08/91	91018890	B767	JA8244	CF6	80A	1	18:25	LR		0	120	SCLD	N	-TAK	TAK	TAKAMATSU,JAPAN	N	"ME
01/17/91	91011850	DC10	JA8535	JT9D	59A	1							N	-SHI	XFO	SHIMOJISHAMA,JAPAN??	N	
01/26/91	91030280	A320	F-GHQE	CFM56	5	1	10:55	TO	N	150	160	OVERCAST	N	ORY-	ORY	PARIS-ORY,FRANCE	N	"CO
01/28/91	91034510	B747	PH-BFD	CF6	80C2	3	13:20	TR	ME	0			N	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	"LA
01/28/91	91034510	B747	PH-BFD	CF6	80C2	4	13:20	TR	ME	0			N	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	"LA
02/06/91	91023560	A320	G-BUSG	CFM56	5	1	8:57	CL		3000	250	SCLD	N	LHR-	LHR	LONDON-LHR,ENGLAND	N	"LA
02/09/91	91011950	B747	JA8186	JT9D	7R4G2	2	19:59	AP		150	145	NCLD	N	-HND	HND	TOKYO-HND,JAPAN	N	

US	BIRDNAME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	IFSD	DMG	REMARKS	ICAO#
N	"GULL-MEDIUM"					2-10		N		SEVERE DMG ACOU.LINER. HIT LDG.GEAR	89014610
Y	"DUCK-LARGE"		1		N			N	1	ENG. DAMAGED	90001050
N	"LARGE"					2-10		N	0	POSSIBLE MULT.BIRD	89100721
N	"MEDIUM"				N			N		STRUCK 2-10 BIRDS.HIT RADOME	89021160
N	"GULL-MEDIUM"					1		N			89014110
N	"GULL-MEDIUM"							N			89014110
N			1					N	0	NO DMG INDICATED	89014150
N								N			89014380
N	"SWIFT-SMALL"		1			2-10		N	0		89015260
N	"SWALLOW-SMALL"		1					N			89015290
Y	"GULL-MEDIUM"				N			N		HIT WING	89023000
N	"OWL-MEDIUM"		1		N			N	1	1FB DEFORM."SUBSTANTIAL DMG."	89019530
N	"MEDIUM"		1		N	2-10		N			89021110
N	"MEDIUM"							N	0		89102271
N	"KITE-LARGE"		1			1		N			89020100
N	"SWALLOW-SMALL"					11-100		N	0	HIT 11-100.MINOR DMG TO LIGHTS	89016650
N	"MEDIUM"		1		N	2-10				BRIEF COMPRESSOR STALL	89006310
N	"SMALL"				N			N		HIT RADOME, ENGINE	89012270
N	"LARGE"		1			1	FLAMEOUT	FLAMEOUT		WNDSHLD DMG.INSTRMNT FAILS.NO ENG DMG.	89019790
N	"MEDIUM"		>1		N			YES		FLIGHT CONTINUED ON 3 ENG."NO DMG"	89019520
N	"BUNTING"		1		N			N	0	SAME A/C AS #708	89002610
N	"GULL-MEDIUM"				N	2-10				ATB DUE TO VIBES	89009770
N						2-10		N	0	HIT LDG.GEAR. LIGHTS DMGD, NOT ENGINE.	89017560
N								N			89018030
N	"SWALLOW-SMALL"				N	2-10		N		HIT WINDSHIELD,WING,FUSELAGE,ENGS.	89007720
N	"SWALLOW-SMALL"				N	2-10		N		HIT WINDSHIELD,WING,FUSELAGE,ENGS.	89007720
N	"BLACK-HEADED GULL"		1					N			89018740
N	"BLACK-HEADED GULL"		1			2-10					89018740
Y	"COMMON GULL-MEDIUM"		1		N			N			89415150
N	"SILVER GULL"						BRIEF INC.EGT		1	2-10 HIT WING,ENGS."SUBSTANTIAL"DMG.	89103321
N	"SILVER GULL"							N	1	"SUBSTANTIAL" DMG.WING,ENGINES	89103321
N	"LAPWING-MEDIUM"					11-100		N	0		89019250
N			1		N			N	0		90016410
Y							YES	HI EGT		ENGINE FAILED.BLEED CONTROL REPLACED.	90042300
N	"MEDIUM"		1		N	1		N		HIT NOSE	89025270
N	"HERON-LARGE"				N			N	1	ENG.DMG.	90006370
N	"SMALL"				N	11-100		N		2-10 BIRDS HIT RADOME,WING,FUSELAGE,ENG.	90016700
N					N			N	1	46 FB REPLACED-COST $340,000.	90005903
N	"SMALL"				N	2-10		N	0		90005570
N	"GULL-MEDIUM"					11-100			0		90011250
N	"GULL-MEDIUM"		1		N	2-10		N	0		90002270
U								N			90026080
U								N			90026080
N	"SMALL"				N	1		N	1	"SEVERE" DMG.RADOME,ENGINE.	90001870
N	"SMALL"		1		N			N	0		91020290
N	"GULL-MEDIUM"				N			N			90022840
Y					N			N		2-10 BIRDS HIT AIRCRAFT	90009210
Y					N			N		2-10 BIRDS HIT AIRCRAFT	90009210
N	"SMALL"				N			N			90001400
N			1			1		N			90014390
N	BLACK-HEADED GULL	P5a35	1	10				N			90014410
N	"SMALL"		1		N	2-10		N			90001330
N	"SMALL"		1		N			N	0		90017900
N						1		N	1	2FB CHANGED."SEVERE DMG."	90027760
N	"SMALL"		1		N			N	0		90027750
N	"MEDIUM"				N			N			90027040
N	"COMMON SONG THRUSH-SM."		1		N			N	0	SMALL BIRD	90018120
Y					N			N	1	"E2 DAMAGED"(SIC)	90405200
Y	"MEDIUM"				N			N	1	"MINOR" ENG. DMG.	90026710
N						11-100		N		HIT WING	90104431
N					N						91018910
N	"MEDIUM"		1		N			N			91018890
N								N			91011850
N	"COMMON LAPWING-MEDIUM"		1		Y	2-10		N	0	SPECIES NOT CONFIRMED	91030280
N	"LAPWING-SMALL"				N	11-100		N		2-10 BIRDS HIT WING,ENGINES.	91034510
N	"LAPWING-SMALL"				N	11-100		N		2-10 BIRDS HIT WING,ENGINES.	91034510
N	"LARGE"					11-100		N		HIT RADOME	91023560
N					N			N			91011950

DATE	ICAO#	A/C	REG	ENG	DASH	POS	TIME	POF	SIGEVT	ALT	SPD	WEATHER	CREW	CITYPRS	APT	LOCALE	US	B
02/16/91	91012010	B747	JA8183	JT9D	7R4G2	4	17:00	AP		800	150	NCLD	N	-HND	HND	TOKYO-HND,JAPAN	N	"G
02/19/91	91012030	B747	JA8186	JT9D	7R4G2	3	20:30	AP	ME	230	155	NCLD	N	-HND	HND	TOKYO-HND,JAPAN	N	"G
02/19/91	91012030	B747	JA8186	JT9D	7R4G2	4	20:30	AP	ME	230	155	NCLD	N	-HND	HND	TOKYO-HND,JAPAN	N	"G
02/20/91	91032910	A320	VTEPT	V2500	A1	1	13:00	AP		1250	140		N	-DEL	DEL	DELHI,INDIA	N	
03/04/91	91033360	B767	PH-MCH	4000	4060	1	11:00	TR	ME	0	168	NCLD	ATB	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	"L
03/04/91	91033360	B767	PH-MCH	4000	4060	2	11:00	TR	ME	0	168	NCLD	ATB	AMS-	AMS	AMSTERDAM,NETHERLANDS	N	"L
03/10/91	91012170	B767	JA8266	JT9D	7R4D	2							N	HKG-NRT	XFO	HONG KONG OR TOKYO	N	
03/15/91	91012250	B767	JA8234	JT9D	7R4D	1	17:45	AP			135	SCLD	N	-HKD	HKD	HAKODATE,JAPAN	N	"L
03/20/91	90101381	B767	VH-RME	CF6	80A	2	11:30	TR		0	135	RAIN	N	TSV-	TSV	TOWNSVILLE,AUSTRALIA	N	"H
03/22/91	91019070	B767	JA8489	CF6	80A	1	11:00	LR		0	130	OVERCAST	N	-SHI	SHI	SHIMOJISHIMA,JAPAN	N	"S
04/05/91	91024000	A320	G-BUSF	CFM56	5	2	10:10	TR		0	90	OVERCAST	N	LHR-	LHR	LONDON-LHR,ENGLAND,UK	N	"P
04/14/91	91019200	B767	JA8251	CF6	80A	1	19:10	AP			130	NCLD	N		???	YAMAGUCH-UBE,JAPAN	N	"S
04/23/91	91030570	A320	F-GJVA	CFM56	5	1	13:24	AP		500	140		N	-NTE	NTE	NANTES,FRANCE	N	"C
04/28/91	91019360	B767	JA8257	CF6	80C2	1						NCLD	N		XFO		N	"S
04/30/91	91019230	B767	JA8271	CF6	80C2	1	12:58	AP		300	130	NCLD	N	-HIJ	HIJ	HIROSHIMA,JAPAN	N	"K
05/02/91	91001130	A320	D-AIPL	CFM56	5	2	16:20	LR		0	100	SCLD	N	-AGP	AGP	MALAGA,SPAIN	N	"D
05/06/91	91030700	A320	F-GHQG	CFM56	5	2	20:07	LR	N	0	110	SCLD	N	-XHE	XHE	HYERES,FRANCE	N	"C
05/07/91	91019400	B767	JA8485	CF6	80A	1							N		XFO		N	
05/09/91	91001080	A320	D-AIPS	CFM56	5	2	12:15	AP		20	135	RAIN		-BCN	BCN	BARCELONA,SPAIN	N	"M
05/15/91	91030800	A320	F-GHQD	CFM56	5	1	15:43	TO		100	140	SCLD	N	TLS-	TLS	TOULOUSE,FRANCE	N	CC
05/17/91	91000990	A320	D-AIPF	CFM56	5	1	11:33	AP		50	140	SCLD	N	-CGN	CGN	COLOGNE/BONN,GERMANY	N	"S
05/18/91	91019510	B767	JA8257	CF6	80C2	1	19:00	LR		0	100	NCLD		-OIT	OIT	OITA,JAPAN	N	"S
05/19/91	91000940	A320	D-AIPK	CFM56	5	1							N		XFO	GERMANY	N	
05/26/91	91024620	A320	G-BUSJ	CFM56	5	1	22:02	AP		150	135	OVERCAST	N	-ABZ	ABZ	ABERDEEN,SCOTLAND,UK	N	"M
05/28/91	91000810	A310	D-AIDE	CF6	80C2	1	7:00	TR		0	115		ATO	NBO-	NBO	NAIROBI,KENYA	N	"S
06/02/91	91019650	B767	JA8290	CF6	80C2	1	17:29	AP		50	130	OVERCAST	N	-OIT	OIT	OITA,JAPAN	N	"G
06/06/91	91034980	B747	PH-BFF	CF6	80C2	4	6:20	LR		0	80	RAIN	N	-AMS	AMS	AMSTERDAM,NETHERLANDS	N	"P
06/14/91	91019720	B767	JA8288	CF6	80C2	1	17:00	AP		100	140	NCLD	N	-HND	HND	YOKYO-HND,JAPAN	N	"M
06/15/91	91019760	B767	JA8484	CF6	80A	1		AP		50	130	SCLD	N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	"M
06/17/91	91019740	B767	JA8243	CF6	80A	1	8:42	LR		0	100	OVERCAST	N	-TTJ	TTJ	TOTTORI,JAPAN	N	"S
06/17/91	91019980	B767	JA8489	CF6	80A	1	8:40	LR		0	140	RAIN	N	-FUK	FUK	FUKUOKA,JAPAN	N	"L
06/28/91	91019920	B767	JA8482	CF6	80A	1							N	OSA-OIT	XFO	OSAKA OR OITA,JAPAN	N	"S
06/30/91	91019780	B767	JA8274	CF6	80C2	1	19:52					RAIN	N		XFO	MATSUYAMA,JAPAN??	N	"S
07/01/91	91020570	B767	JA8273	CF6	80C2	1							N		XFO		N	
07/02/91	91020540	B767	JA8251	CF6	80A	1	16:53	LR		0	80	SCLD	N	-TOY	TOY	TOYAMA,JAPAN	N	"S
07/08/91	91002370	A320	D-AIPS	CFM56	5	2	7:23	TO		5	155	CLEAR	N	VIE-	VIE	VIENNA,AUSTRIA	N	"B
07/13/91	91020510	B767	JA8489	CF6	80A	1	7:43	TO		50	143	RAIN	N	HND-	HND	TOKYO-HND,JAPAN	N	"M
07/24/91	91031460	A320	F-GJVA	CFM56	5	1	11:03	TO		50	160	NCLD	N	ORY-	ORY	PARIS-ORY,FRANCE	N	"E
07/24/91	91020230	B767	JA8287	CF6	80C2	1	8:27	AP		50	126	NCLD	N	-KCZ	KCZ	KOCHI,JAPAN	N	"S
07/24/91	91020150	B767	JA8272	CF6	80C2	1	8:40	TR		0	125	SCLD	N	SDJ-	SDJ	SENDAI,JAPAN	N	"K
07/26/91	91031500	A320	F-GFKP	CFM56	5	1	17:06	AP	MB?	80	145	SCLD	N	-CDG	CDG	PARIS-CDG,FRANCE	N	"M
07/31/91	91026360	B767	G-BRIG	CF6	80A	1	19:10	TR	MB?	0	140		N	DLM-	DLM	DALAMAN,TURKEY	N	"S
08/06/91	91020780	B767	JA8271	CF6	80C2	1	20:11					OVERCAST	N		XFO	MATSUYAMA,JAPAN??	N	
08/06/91	91020730	B767	JA8486	CF6	80A	1	17:13	TR		0	120	NCLD	N	SHI-	SHI	SHIMOJISHIMA,JAPAN	N	"S
08/12/91	91020710	B747	JA8096	CF6	80C2	1							N		XXX		U	
08/16/91	91021180	B767	JA8274	CF6	80C2	1	19:50	AP		10	135	NCLD	N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	"M
08/19/91	91021170	B767	JA8288	CF6	80C2	1	19:04	LR		0	110	OVERCAST	N	-TOY	TOY	TOYAMA,JAPAN	N	"B
08/20/91	91021160	B767	JA8275	CF6	80C2	1	19:12	LR		0	135		N	-TOY	TOY	TOYAMA,JAPAN	N	"B
08/21/91	91021130	B767	JA8288	CF6	80C2	1	10:48	LR	MB?	0		OVERCAST	N	-MYJ	MYJ	MATSUYAMA,JAPAN	N	"S
08/22/91	91003990	A320	D-AIPS	CFM56	5	2	10:55	TR		0	120	NCLD	ATO	DUS-	DUS	DUSSELDORF,GERMANY	N	"M
08/31/91	91020930	B767	JA8289	CF6	80C2	1	19:01		MB			SCLD	N	-TOY	XFO	TOYAMA,JAPAN??	N	"B

	US	BIRDNAME	SPEC	#BDS	WT	ALERT	SEE	POWLOSS	IFSD	DMG	REMARKS	ICAO#
	N	"GULL-MEDIUM"				Y	1		N	1	ENG.DAMAGED	91012010
	N	"GULL-MEDIUM"				Y	2-10		N	0	HIT WING,LDG.GEAR.	91012030
	N	"GULL-MEDIUM"				Y	2-10		N	0	HIT WING,LDG.GEAR.	91012030
	N			1					N			91032910
IDS	N	"LAPWING-MEDIUM"				N	2-10			1	3FB "SEVERE DMG",FUSELAGE HIT	91033360
IDS	N	"LAPWING-MEDIUM"				N	2-10			1	MINOR ENG.DMG. FUSELAGE HIT	91033360
	N								N			91012170
	N	"LARGE"				N	1		N	0		91012250
	N	"HAWK-MEDIUM"		1					N	0	2-10 HAWKSSTRUCK NOSE, ENGINE.	90101381
	N	"SPARROW-SMALL"				N			N		2-10 BIRDS HIT AIRCRAFT	91019070
IK	N	"PIGEON-MEDIUM"		1					N			91024000
	N	"SMALL"				N			N			91019200
	N	"COMMON SONG THRUSH-SM."		1		N	2-10		N	0	SPECIES NOT CONFIRMED.	91030570
	N	"SMALL"				N			N			91019360
	N	"KITE"		1		N			N	0		91019230
	N	"DOVE-MEDIUM"		1		N	2-10		N			91001130
	N	"COMMON SWIFT-SMALL"		1		Y	11-100		N	0		91030700
	N					N			N			91019400
	N	"MEDIUM"					1					91001080
	N	COMMON SWIFT	U3b68	1	1		2-10		N	0	SPECIES CONFIRMED	91030800
IY	N	"SMALL"		1		N	2-10		N			91000990
	N	"SMALL"		1					N			91019510
	N			1		N			N			91000940
(	N	"MEDIUM"		1			2-10		N			91024620
	N	"STORK-LARGE"				N	2-10			1	"SEVERE"ENG.DMG.FB CHANGED.HIT LDG GEAR	91000810
	N	"GULL-MEDIUM"		1		N			N			91019650
IDS	N	"PHEASANT-MEDIUM"		1		N	1		N	0	WING, ENGINE STRUCK.	91034980
	N	"MEDIUM"		1		N			N	0		91019720
	N	"MEDIUM"				N			N		2-10 BIRDS STRUCK AIRCRAFT.	91019760
	N	"SWALLOW-SMALL"		1		N			N			91019740
	N	"LARGE"		1		N			N			91019980
	N	"SMALL"		1		N			N			91019920
	N	"SMALL"				N			N			91019780
	N					N			N			91020570
	N	"SPARROW-SMALL"		1		N			N			91020540
	N	"BUZZARD-LARGE"				N	1		N	1	"SUBSTANTIAL" ENGINE DMG.	91002370
	N	"MEDIUM"		1		N			N		HIT NOSE,WING,ENGINE.	91020510
	N	"EURASIAN KESTREL-MED."		1		Y			N	0	SPECIES UNCONFIRMED.	91031460
	N	"SPARROW-SMALL"		1		N			N			91020230
	N	"KITE-MEDIUM"		1		N			N			91020150
	N	"MEDIUM"				N	2-10		N	0	HIT NOSE, ENGINE.	91031500
	N	"SWALLOW-SMALL"					11-100		N		11-100 BIRDS STRICK AIRCRAFT	91026360
	N					N			N			91020780
	N	"SMALL"				N			N		HIT RADOME.STRUCK 2-10 BIRDS.	91020730
	U					N			N			91020710
	N	"MEDIUM"		1		N			N		HIT NOSE, ENGINE	91021180
	N	"BAT-SMALL"				N			N		2-10 BATS HIT WING, ENGINE	91021170
	N	"BAT-SMALL"		1		N					HIT WING, ENGINE.	91021160
	N	"SPARROW-SMALL"				N			N		2-10 STRUCK AIRCRAFT	91021130
	N	"MEDIUM"		1		N		SURGE	U	0	LOUD BANG(SURGE).30 MIN. DELAY.	91003990
	N	"BAT"				N			N		11-100 BATS HIT AIRCRAFT	91020930